

\$1,000 IN CASH PRIZES EVERY MONTH

See Page 14

25 CENTS

Swing this trusty hatchet straight and true

WHAT you want in a hatchet,—the Plumb hatchet has—plus a won-derful safety device.

The tough, hard edge of this hatchet keeps its keenness — Plumb tempering methods are famous. The strength of the eye is assured by Plumb armor-plate heat treatment. And the head is hardened for husky work.

Balance and power for hard, deep cutting or for accurate, careful slicing. This blade goes where you send it!

And, whether new or old, your Plumb is safe to swing. For the Plumb Take-Up Wedge gives you a tight head always; a turn of the Wedge takes up any shrinkage in the handle.

You get these features in Plumb tools only. You get them by simply looking for the Red Handle and the Black Head.

Buy the trusty Plumb Hatchet — easy to find in any hardware store. Easy to swing straight and true!

FAYETTE R. PLUMB, Inc. Philadelphia, U. S. A.



Hammers Hatchets Files Sledges Axes

Instantly, with a two of the west, you retighted the head of any lamb took. V shape of a language would be to against all sides of ape, all the way in.





They shall not pass-"

WITH this watchword of determination the French held back their foe at Verdun. Today "they shail not pass" is a watchword equally determined in Western Electric telephone making—only here it always means "defective materials and apparatus shall not pass."

Inspection, inspection, inspection is the order of the day in this work of making telephones and telephone equipment.

From the raw material stage, when strength tests and quality tests are rigorously applied, through every step of manufacture, a telephone must qualify for service—and do so before a chain of critical inspectors.

This insistence on high standards of materials and workmanship is Western Electric's day-today part in making Bell telephone service the standard of the world.

Buch of

JOSE

telephane.



Copyrighted missississ



A machine initiates the hand, lifting and replacing a telephone receiver. An endurance test,

Western Electric

SINCE 1882 MANUFACTURERS FOR THE BELL SYSTEM

Popular Science Monthly

MAY, 1926; Vol. 108, No. 5 25 cents a Copy; \$2.50 a Year



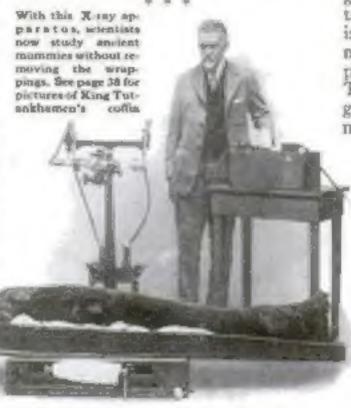
Published in New York City at 250 Fourth Avenue

Don't Miss These Features

ested in a home of his ownand who is not?-will find an immense amount of useful information on the subjects of home building and home keeping in our interesting articles by John R. McMahon. Each month this noted expert discusses in detail some vital problem of home ownership, giving valuable suggestions from his long experience. On page 28 of this issue he tells how to build a new home out of an old one. Next month he will explain the mysteries of architects' blueprints in such a way that you will be surprised how easy it is to read and understand them.

ND don't forget, there's an-A other absorbing \$1,000 Picture Contest this month. Next month there will be still another one. In this unusual series of contests you have just as good a chance as anyone to win one of the big cash prizes-and you are sure of a lot of entertainment to

VERY man who is at all inter- boot. Turn to page 14 of this issue and see how wide-awake you are.



OP THE many fascinating "How to make it yourself" articles which appear from month to month in our Home Workshop Department, few have made our fingers so "itch to get at it" as Captain McCann's detailed description, beginning in this issue, of how to build the beautiful model of an old-time Spanish galleon, pictured on the cover of this issue. The constructional details which begin on page 71 will be concluded next month.

> ONE of the finest works of handicraft to be found anywhere in the world has just come to light. It is the marvelous goldengraved coffin of ancient Egypt's Pharach, Tutankhamen, Don't fail to look at the pictures of this magnificent sarcophagus on page 38. As you wonder at its intricate craftsmanship, you will realize how science, delving into forgotten ages, is enriching our knowledge of the world we live in. Every month POPULAR SCIENCE MONTHLY aims to give you new glimpses of the world's unfolding panorama.

In This Issue-200 Articles and Pictures, including

Chi agel Birthelev The Discount Sen Research By Edgar C. Bi barder Strome Prior Contest The Typical American He Lived Two Greens Love. By Robert E. Martin Sing Count Oil-Electric Lovers lives. By Count Oil-Electric Lovers lives. By Grange Lee Donal Je How Larget Cgo a Star Bel. 22 The Words a treasless Parson. By Same Loyd Unique Radio Pon Makes Ink Copies. The Acony and Your Boy. By Arthur Grandense How he Remarks and Homes. By John R. McMakes. Only the Darting Work for thes. By Earl Chapter Work for thes.		41/19/44
Clear age! Methoday The Directors See Research By Espair C. Wheeler Strong Prizer Contest The Typical American He Lived Two Great Love By Robert E. Martin Sing Court Oil Electric Loves 19 By Groupe Lee Donal Je How Large Cgo a Star Rel The World a Createst Parades. By Sam Loyd Integral Radio Pen Makes Ink Copies The Acory and Your Boy By Arthur Craftente How to Recombel an Old House By Juin R. McMahana Only the Daring Work for thee By Earl Chapter Wark for the By	Popular Science Institute of Standards	- 6
The Liveanest See Research By Edgar C. Histories St. 2002 Prior Contest The Typical American Re Lived Two Green Love By Robert E. Martin Sing Course Dil-Electric Lover Lives By Course Lee Donad Je How Large Cgo a Star Ret The Words a treatest Posson By Sam Loyd Income Robert Pon Makes Ink Copies The Acony and Your Boy By Arthur Grafique Roy Loyd Robert Loyd Pon Makes Ink Copies The Acony and Your Boy By Arthur Grafique Roy Loyd Robert Pon Makes Ink Copies The Acony and Your Boy By Arthur Grafique Roy Loyd Robert Work for Homes By Janu R. McMahan Only the Daring Work for Homes By Earl Chapter Wark for Homes	Charles Birthday	· ·
St. one Prine Contest The Type of American The Lived Two Green Lives The Robert E. Martin Sine Come Oil-Electric Lives The Conne Oil-Electric Lives The George Lee Doned Je. How Large Can a Star Re. The World's American Princes. The World's American Princes. The World's American Princes. The World's American Princes. The American Loyd Compute Radio Pen Makes Ink Copies. The American Voir Boy. The Damin Work for Home. The Earl Chapter Wark for Home. The Earl Chapter Wark for Home.	The Liteatest Sen Research	_11
St. one Prine Contest The Type of American The Lived Two Green Lives The Robert E. Martin Sine Come Oil-Electric Lives The Conne Oil-Electric Lives The George Lee Doned Je. How Large Can a Star Re. The World's American Princes. The World's American Princes. The World's American Princes. The World's American Princes. The American Loyd Compute Radio Pen Makes Ink Copies. The American Voir Boy. The Damin Work for Home. The Earl Chapter Wark for Home. The Earl Chapter Wark for Home.	By Edgar C. Wheeler	
The Typical American He Livel Two Great Laws Hy Robert E. Martin Sing Court Oil-Electric Loops hard Hy Groupe Lee Dound Je How Large Cap a Star Rel The World's Counter Tourism. By Same Loyd Integral Radio Pon Makes Ink Copies The Acroy and Your Boy By Arthur Grafique How to Remailed an Old House Hy Jain H. McMahan Only the Daring Work for the By Earl Chapin May Hongry Mothe Coot Us Manners		14
He Gived Two Great Love By Robert E. Martin Sing Court Oil-Electric Lovers Ivers 19 A Garine of Garcine Lovers Ivers 20 By George Lee Dound Je. How Large Cao a Star Rel 22 The World's Connected Tourier. 21 By Same Loyd 19 Engine Radio Pen Makes Ink Copies 18 The Acroy and Your Boy 26 By Arthur Grafiques 18 By John R. McMahana Only the Daring Work for Home 31 By Earl Chapter Way How Makes 19 By Earl Chapter Way Howens 33 Hongry Mothe Coot Us Makes 33		36
By Robert E. Martin New Court Oil-Electric Longs lives 19 A Garne of Gardene Longstrates 20 By George Lee Donal Je How Longs Coo a Star Rel 22 The World's Greatest Passen. 21 Ry Sam Loyd Unique Radio Pon Makes Ink Copies 18 The Acroy and Your Boy 26 By Arthur Grafiante Roy Loyd Radio Pon Makes Ink Copies 26 By Arthur Grafiante Roy In R. McMahan Only the Daring Work for Hone 31 By Earl Chapter Wark for Hone 33 By Earl Chapter Wark for Hone 33 Ry Earl Chapter Wark for Hone 33	Ha Library Turn Green's Lowers	17
Saw Came Oil-Electric Longs lives 19 & Game of Game on Long-taining 20 By Game Lee Dond Je How Large Can Star Be 22 The Works Streetest Pagents 23 By Sam Loyd Unique Radio Pen Makes Ink Copies 18 The Acory and Your Boy 26 By Arthur Grafiante Roy Loyd Remarks an Old House 26 By John R. McMakes By John R. McMakes By John R. McMakes By Earl Chapter Wark for the 31 By Earl Chapter Wark for the 33		
A Garne of Mark De Lavortanter 20 By Grange Lee Dond Je How Lavor Cgo a Star Rel 22 The World's Introduct Parties. By Sam Loyd Introduct Radio Pen Makes Ink Copies 18 The Acroy and Your Boy 26 By Arthur Grafiume Roy and Your Boy 26 By Arthur Grafiume Roy July R. McMakes Only the Daring Work for Hon 31 By Earl Chapter Work for Hon 31 By Earl Chapter War.		10
By George Lee Dowd Je How Large Cao a Star Re 22 The World a terestest Possien. 23 By Sam Loyd I mone Radio Pen Makes Ink Copies 48 The Acory and Your Boy 26 By Arthur Grafiante Row to Remadel an Old House 26 By Jahn R. McMahan Only the Daring Work for Hom. 31 By Earl Chapin May Hongry Moths Coot Us Momens 33	4 Come of Observe University	76)
How Large Can Star Ret 22 The World's Createst Purses. 21 Ry Sam Loyd Unique Radio Pen Makes Ink Copies 25 The Acres and Your Boy 26 By Arthur Grahams How to Remarket an Old Horne 26 Ry July R McMahan Only the Daring Work for the 31 R) Earl Chapse Way Hongry Moths Cost Us Manage 33	Bu Course Les Dount Le	217
The World's Countest Pursion By Sam Loyd Unique Radio Pen Makes Ink Copies The Acory and Your Boy By Arthur Grahame How to Remailed an Old House By John R. McMaham Only the Daring Work for Hors By Earl Chapter May Hongry Moths Cost Us Manene 33		22
By Sam Loyd Unique Radio Pen Makes Ink Copies 13 The Acory and Your Boy 26 By Arthur Grafiques How to Remailel an Old House 28 By John R. McMahan Only the Daring Work for Hor 31 By Earl Chapter May Hongry Moths Cost Us Momens 33	The state of the state of	-55
Unique Radio Pen Makes Ink Copies 18 The Acres and Your Boy 26 By Arthur traditions How to Remarks an Old House 26 By Julia H. McMakes Only the Daring Work for Hon 31 By Earl Chapter May Hongry Moths Cost Us Momens 33		-82
The Acord and Your Boy 26 By Arthur Grafiums How to Remarket an Old Horne 26 By John R. McMahana Only the Daring Work for Horne 31 By Earl Chapter May Hongry Moths Cost Us Momens 33		44
By Arthur Grahame How to Remodel an Old Horne 28 By Jake H. McMaham Only the Daring Work for Horn 31 By Earl Chapter May Hongry Moths Cost Us Momens 33	Inique Radio Pen Makes Ink Copies	
How to Remarks an Old House 28 By John R. McMakon Only the Daring Work for Hon 31 By Earl Chapter May Hongry Moths Cost Us Mothers 33	The Acmy and Your Boy	26
By John R. McMahon Only the Daving Work for Hon		-
Only the Daring Work for Hon. 31 By Earl Chapter Way Hongry Moths Cost Us Motions 33		- 28
By Earl Chaple Way Hungry Moths Cost Us Monone 33	By Jahn R. McMahou	
Hungry Moths Cost Us Mollions 33	Only the Daring Work for Him.	31
Hongry Moths Cost Us Motions 33 By G. B. Serbold		
By G. B. Seybold	Hungry Moths Cost Us Mollions	- 33
	By G. B. Seybold	
Planning the World's Largest Arrains 34		34
By John K. Martin	By John K. Martin	

Can You Beat Them?	-36
Where Movies Get Their Props	- 17
A DESCRIPTION OF THE PERSON NAMED IN COLUMN 2 AND ADDRESS OF THE P	38
Ascient Fossis with Life Forms	140
Crant Crance in Record People	44
Stampeouf Three is One Dirighte	4.7
Marmha Produced by Electra: Facts	-13
Sharm Door Lane & Kroper Door	-12
Hose Dam to Form Mountain Lake The Cartino Sole of Thougan Cold Light Obtained with Liquid Leon	-63
The Currous Sele of Tlangs	#4 #1
Cold Light Obtained with Liquid Lerin	
Women Stelled at Electric Work.	46
Lock Hax 1024 Combinations	46
Decarded Grandstons Make Fine Walts.	15
Democial Grandstone Make Fice Walls.	
Descript Grandstone Make Free Walls. Work While You Talenta	46 15 57
Descript Grandstone Make Free Walls. Work White You Transfer A Nevel Song In Children Free Shade for Automobilists	
Descript Grandstone Make Free Walls. Work White You Transfer A Nevel Song In Children Free Stude for A thomobolists. Crass Catalog Tax Evenly	15 157 112
Described Grandstone Make Fine Walls. With White You Talendard A Novel Sange In Children Fine Shade for A throublists Const Californ In Expense Lagranger Ross Memature Train	45万元
Described Grandstoon Make Fine Walls With White You Talento A Novel Song In Colors Fine Shade for Automobileta Cran Califor as Experty Count Regimest Ross Miniature Toxic Bushing Star Makes His Own Bulls	15 157 112
Descried Grandstone Make Fine Walls. With White You Transfer A Novel Sonig In Control Fine Shade for Automobilists Cran Labour R. on Minutery Train Buselin Star Makes His Own Bull Fine Walls Makes His Own Bull Fine Walls His Own Bull	47 47 47 42 48 48 48
Descript Grandstone Make Fine Walls. With White You Transfer A Novel Soning for Chicken Fine Shade for Automobilets Cran Labour E. Erren's Lagranger Rans Miniature Train Buse of Star Makes His Own Bulls Fire Vision Tractor House S.	47 47 42 48 48 48 48
Descript Grandstone Make Free Walts. W. S. W. S. V. T. A Novel Stone II. A limited site. Free Shade II. A limited site. Buse in Star Makes II. On Bulb Free Value II. II. Washington. He Made II. II. II. S. E. S. A Novel Published II. S. S.	45 47 42 42 48 48 48 48
Described Grandstone Make Free Walts. W. S. W. S. Ver, T. A. N. Stands of All the blacks Free Shade for All the blacks Buse of Star Makes He One Bulb Free Walts He Made Thin Tarter House S. A. Nood Potter of H. K. Shade Lawre Arms Bridge	47 47 42 48 48 49 49
Descript Grandstone Make Free Walts. W. S. W. S. V. T. A Novel Stone II. A limited site. Free Shade II. A limited site. Buse in Star Makes II. On Bulb Free Value II. II. Washington. He Made II. II. II. S. E. S. A Novel Published II. S. S.	45 47 42 42 48 48 48 48

When the American Eagle Is Captured 3	3
Strawberry Patch in a Barrel	2
Three Tenas Lemons an Armful	2
"I3" His Lucky Number 5	1
Fusitions Mosaics from Egg Shells	13
How You Can Grow a Pearl 3	Į,
A Bedween Set of Postage Stanips	i
A Hodsoom Set of Postage Stange How a Great City Protects Its Post	4
South for Land and Water	5
	6
Novel Devices Lighten Household Tasks	ä
To a III a com-	Ð
Radio Here and There. 6	2
Kon Can Now Takes on the lot	q
100 Lan Now I have on the lot	4
TT TO THE TOTAL TOTAL TO THE TOTAL TOTAL TO THE TOTAL TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TOTAL TOTAL TO THE TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TO THE TOTAL TOTA	å
By Martin Huns	ń
Annual to the second of the se	a
Home Workshop71	
Better Shop Methods	

Making History in Association.

POPULAR SCIENCE MONTHLY

Insued monthly Single copy, 25 cents. Yearly substriction to United States its presentation, and I usuals, \$2.40; foreign countries, \$3.5; intered at second-class matter the 23, 1915, or the Post Office of New York observing Elizabeth 1, 1879; additional entry as second-class constant at Chicago, Elizabeth Entered at second-class matter at the Post Office Department, Canada, Printed in U.S.A. Cupyright 1976, by the Popular Science Publishing Co., Inc. The success of

this magazine must not be cordined without permission. In presenting is its colored colored colored parties of one products of applied scheme, Portugal Colored Montes of the ladividuals or concerns mechanic them. The use of Pure the scheme Montes of the ladividuals or concerns mechanic them. The use of Pure the scheme Montes of the ladividuals or question from them for stock-religier schemes is never authorized. O. R. Capen, President and Treasurer, R. C. Wilson, Vice-President A. L. Cole. Secretary,



perate your present radio set from the light socket

with Balkite "B" and a Balkite Trickle Charger

Balkite Trickle Charger Converts any 6-vult "A" bettery of 10 ampets hours or more into an estomatic "A" power unit that furnishes "A" current from the light socker. With 4-volt and smaller 6-volt herteries may be used as an intermittent charger. Or as a trickle char-ger if a resistance is added to cut three the charging rate, \$10. West of Rockies, \$10.50. In Canada, \$15.



Balkite Battery Charger The popular rapid charger for 6 vols "A" bassezies, Noteeless, Can be used while the set is in operation. Special model for 25-40 eveles, \$19.50. West of Rockies, \$20, In Canada, \$27.50.



Balkita "B"

Eliminates "B" batteries and supplies place current from the light socket. Keeps the B" elegalt always at full power. For sets of 6 tubes and less, 555. In Connds, \$49.50.

Salleite "B" II

Will serve any standard out. Capacity 20 milliamperes at 135 volts, Especially adapted to sees of 6 tubes or more, \$55. la Canada, \$75.

The radio set you now own will operate from the light socket. No changes are necessary. You need only add Balkite "B" and a Balkite Trickle Charger.

Balkite "B"-the noiseless "B" power supply-replaces your "B" batteries entirely and supplies plate current from the light socket. The Balkite Trickle Charger keeps your "A" battery always at full charge, also from the light socket. If you like you may also purchase from your dealer an automatic switch that cuts out the charger and turns on Balkite "B" when you turn on the set.

This type of installation is the last word in radio convenience and ease of operation. You never have to operate your set on a weak power supply or worry about replacing

or recharging batteries. One turn of the switch and you have full, even power, exactly as required by the set. And because you always have full power you secure a quality of reception possible in no other way.

Both Balkite "B" and the Balkite Trickle Charger are entirely noiseless. Their first cost is the last. Both are permanent pieces of equipment with no bulbs, nothing to replace, break or get out of order. There is no further expense other than a negligible amount of household current.

Thousands of radio owners have already made this simple addition to their sets. You can make it too, and convert your set into a light socket receiver. Ask your dealer about it today.

Radio Power Units

MANUFACTURED BY FANSTEEL PRODUCTS COMPANY, INC., NORTH CHICAGO, ILL.

Side Licenson in the United Kingdom: Meurs, Radio



City/I/Del Butteral



Do You

NEED A SELF-STARTER?

Success - Do You Know the Way, and How to Get Started?
Here is How Some People Found Out

EVERY MAN wants to be successful; not every man is. Very often, it is the lack of a start that keeps a man back—the knowledge of HOW to get ahead.

We all read stories of how men have succeeded, but many of these discourage rather than help us. It seems as if these men have so much greater ability, so many more opportunities than we have. We don't stop to think of how they improved that ability, and how they

learned to grasp those opportunities. Obstacles are in every man's way—it's the man who learns to step over them that wins.

Your obstacle may be lack of specialized knowledge in your own field of work. Then you will be interested in this very definite letter that tells how one man learned "how." It brought Mrs. A. Lundeen of Forest Lake, Minnesota, the first prize of \$50 in POPULAR SCIENCE MONTHLY's contest, last month.

Contest Editor:

Among the numerous graduates of the Coyne Electrical School, I think my friend and relative is the one most rational.

Here is the reason. Before taking the course he was receiving \$35 a week. Now he is receiving \$700 a month, or an increase of \$00 per cent. This raise in salary took place during the last four years and will very likely keep on for some time.

Under those conditions, most anyone would be satisfied.

MRS. A. LUNDEEN

Your road to success may be along a different route than this man's, but the Money-Making Opportunities Section of POPULAR SCIENCE MONTHLY offers suggestions for 83 different ways.

And it is finding the way, and getting started, that counts. Aims and ambitions are fine things to possess; they are as essential to you as the engine is to a car. The thing to be sure of, however, is that your ambitions are not deteriorating into mere wishes (the upholstery of the car, that is comfortable but doesn't get you anywhere).

Here is the story of a man who started his engine and made his car GO!

Contest Editor:

The advertisement of the International Correspondence Schools in the March issue of Popular Science brought to my mind a very good example of how much these schools can do for a man who has not had the advantages of higher education.

This man that I write of had not even had a high school

education and he held a position where he really needed more advanced training. Realising his deficiencies, he enrolled in a course of Business Management and studied diligently.

rolled in a course of Business Management and studied diligently.

The results of this course showed almost from the start and it was not long before he began to advance up the ladder. His premotions were rapid until now—only about ten years after his enrollment—he is President and General Manager of that same firm with which he started in a lowly position. He has also held the Mayor's chair in his home city. Surely a wonderful result of their training.

CLARENCE M. MINOTT, Hanger, Maine

President, General Manager, and Mayor—these are surely titles that are in the back of every ambitious mind. This man wasn't content to leave them there, though, but found the road to realization. For the letter describing his ascent was awarded the second prize of \$25.

To help its readers find their "roads," Popular Science has

grouped together all the advertisements that offer suggestions, in a Money-Making Opportunities Section that you will find on pages 116 to 142 of this issue. Advertisements of courses of training, residence schools, technical books, sales agencies, patent attorneys, and advertisements of a similar nature will be found there.

It may be that, a year from now, this section will bring to your mind thoughts similar to Mr. Herdt-felder's. Here is his letter that won him the third prize of \$10 in last month's contest.

Continued on page 116

\$100 in Cash Prizes

For the best letter in answer to the questions:

What advertisement in the MONEY-MAKING OPPORTUNITIES SECTION interests you most—and why?

we will pay \$100 in cash prizes. For full details—

See Page 116

83 Short Cuts to Success

SEE PAGES 116-142

City (1) that has been

Radiotron UX-199 Radiotron UV-199
the name turbe but with
the state of the state of

ín cost to run

T'S the special filament of an RCA Radiotron UV-100 (or UX-100) that makes it cost so little to run. This tube draws so little current that for a limited time it can even be operated from flashlight batteries—for your portable sets! It never needs more than inexpensive dry batteries—and it uses them up slowly.

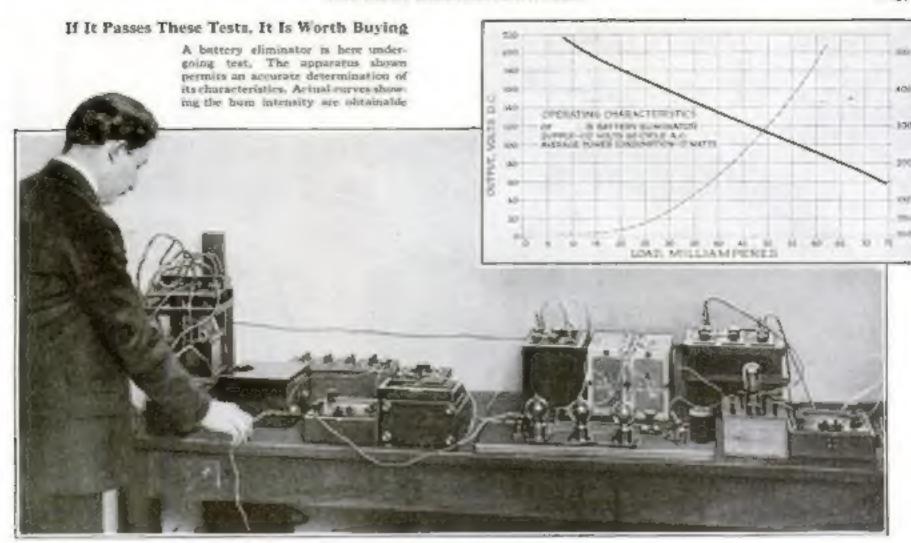
The thoristed filament of this tube is specially treated, so that there is always a layer of thorium a single atom deep on the filament-surface. And electrons leap from the thorium at a stupendous rate—conveying the music and the speech.

Because this type of filament gives off more electrons at less heat—it lasts longer, and it uses less battery current. And because this type of filament was developed in the great research laboratories that contribute to RCA, you will find it in every genuine RCA Radiotron UV-199 and UX-199. Another good reason for being careful to find the RCA mark on the base when you buy!

RADIO CORPORATION OF AMERICA New York Chicago San Francisco

RCA Radiotron

MADE BY THE MAKERS OF RADIOLAS



Are You Buying

A B-Battery Eliminator?

JUDGING by the hundreds of letters we have received at the Institute on the subject, there is more interest in—and more doubt about—battery eliminators than any other type of radio equipment on the market.

An efficient eliminator is, without question, a worth-while addition to a radio outfit. A poor eliminator will ruin an otherwise satisfactory outfit. And that a large proportion of the eliminators on the market are inferior is proved by the fact that the Popular Science Institute of Standards has had to disapprove after test more products under this classification than any other.

The "hum" and other objectionable features that are found in so many eliminators are not to be found in the chiminators approved by the Institute. Following are the characteristics that a B eliminator must possess to merit the approval of

the Institute:

 Sufficient capacity, so that it may maintain its output d. c. voltage at its rated value when used with standard receiving set using five or more tubes.

Reasonably good inherent "voltage regulation" or a manual control of "output voltage," for voltage adjustment.

 The rectifying element must give a reasonably long, useful service.

4. The construction must be such as to insure continuous operation with By ALEXANDER SENAUKE, E. E.

Radio Engineer,

Popular Science Institute of Standards

freedom from breakdown, fire hazard, or electric shock.

The filter effectiveness must be sufficient to make its operation, when properly installed, free from disturbing hum or other line noise.

Eliminators that are submitted for test to the Institute are tested by specially devised test methods to check their conformance to these five characteristics.

Characteristic No. 5 is a major prerequisite for all battery eliminators. In testing the "filter effectiveness of B battery eliminators," in the radio laboratory of the Institute, the various conditions of operation are simulated by variable resistors and measuring instruments. For each condition, the "alternating" or "hum producing" component of the output of the climinator is separated and impressed upon a special, calibrated amplifier and vacuum tube voltmeter device that amplifies this alternating component to an even greater extent than it is normally amplified in a receiving set, and permits of its being measured on an electrical meter. The reading of this meter, therefore, gives a quantitative indication of the amount of "hum" that the eliminator will produce when used to operate a receiver.

Readers who are planning to buy a B eliminator will undoubtedly be interested in the list of approved radio and tool products that can be obtained free of charge by writing the Popular Science Institute, 250 Fourth avenue, New York City,

CHARLES HOME

POPULAR SCIENCE Monthly

Guarantee

The above seal on an advertisement indicates that the products referred to have been approved after test by the Popular Science institute of Standards.

POPULAR SCHENCE MONTHLY guarantees every article of merchandise advertised in its columns. Readers who buy products advertised in POPULAR SCHENCE MONTHLY may expect them to give absolute satisfaction under normal and proper use. Our readers in buying these products are guaranteed this satisfaction by POPULAR SCHENCE MONTHLY.

THE PUBLISHERS.



Council russial

Confidence

Confidence in that uninterrupted service you expect from your radio means belief that there is unusual quality behind the dials—in design, in materials, in workmanship.

ALL-AMERICAN furnishes many guarantees of such quality. But the best of guarantees, for an experienced buyer, is the knowledge that a noted organization of specialists in fine radio, equipped with every facility for creating excellence, stands sponsor for the product.

All-American Model R: a five-tube runed-radio-frequency toroid receiver, Rauland-Lyric-equipped. Price \$90 (West of the Rocky Mountains \$95)

The leading wholesaler of radio apparatus in your community has probably been for years an ALL-AMERICAN Authorized Distributor. ALL-AMERICAN Guaranteed Radio Products ore sold everywhere by responsible and reliable dealers.

ALL-AMERICAN RADIO CORPORATION Pioneere in the Industry E. N. Rauland, Pres. Belmoni, Tripp and Kennasha Avenues, Chicago, U. S. A.



The Laboratory



The Test Room



The Factory





ALL-AMERICAN

Radio Built for the Years to Come





"The little wrinkle that makes my 'B' batteries last longer is using the right size Evereadys with a 'C' battery"

"I USED to think that because the Eveready 'B' Battery No. 772 cost less than either of the larger Heavy Duty Evereadys that I was saving money. As a matter of fact, on four or five tube sets, that was false economy.

"The right size Eveready 'B' Batteries to use depends on the number of tubes in your set. The life of the batteries depends on how much you listen in and on whether a 'C' battery is employed."

To get the maximum of "B" battery life and satisfaction, follow these simple rules:

On 1 to 3 tubes—Use Everendy No. 772.

On 4 or more tubes — Use the Heavy Duty "B" Batteries, either No. 770, or the even longer-lived Eveready Layerbilt No. 486.

On all but single tube sets—Use a "C" battery*.

Follow these rules, and No. 772, on 1 to 3 tube sets, will last a year or more; Heavy Duties, on sets of 4 or more tubes, eight months or longer.

The average year-round use of a set is two hours a day. If you listen longer,



your "B" batteries will have a somewhat shorter life. If you listen less, they will last longer.

Our new booklet, "Choosing and Using the Right Radio Batteries," is free for the asking. It also tells about the proper battery equipment for the new power tubes.

"Near: In addition to the increased life which an Everyady "C" Battery gives to your "B" batteries, it will add a quality of reception unablainable without it.

Manufactured and guaranteed by NATIONAL CARBON CO., INC. New York San Francisco

Camedian National Carlos Co., Limited Toronto, Ontario

Tuesday night means Eveready Hour9 P. M., Eastern Standard Time, through
the following stations:

WEAP-New York wen-Buffalo
WJAD-Prinsidence wear-Pittsburgh
WEAI-Borles Was-Cincinnali
WTAG-Worcester WEAR-Cleveland
WTI-Philadelphia WWJ-Detroit

won-Chicago
woc-Darenport
ween St. Paul
Est-St. Lines

Cityrighter number



1872

1926

Our 54TH BIRTHDAY

AN EDITORIAL

OPPLIAR SCIENCE MONTHLY IS CI YEARS old with this issue, not a bad age-for a man or a magazine. And yet at 54, birthdays have a way of following each other so closely that one is apt to slip by unremembered So it might have been with us this year, but for Edward S. Pattison, student of engineering at Reasselaer Polytechnic Institute, Troy, N. Y. From Mr. Pattison, born thirty-odd years after Popular Science Monthly, came a

note of appreciation of the help the pages of this magazine have given him a selecting his life. work. With the note came a copy of POPULAR SCIENCE MONTHLY for May, 1872, the first issue ever published. The magazine had been in the family library

more than half a century

Those today who are making POPULAR SCIENCE MONTHLY had nothing to do with the magazine of 1871. Most of us were yet unborn But Mr. Pattison's letter, and others lake it, prove to us that our trail has been straight; our progress true. In that first issue of ours, Edward Livingston Youmans, the blind genius and founder of POPULAR SCIENCE MONTHLY, Wrote of its purpose:

"Science is not the mystery of a class, but the common interest of rational beings, in whom think-

ing determines action.

"It is this immense extension of the conception of science, in which all the higher aubjects of human interest are now included, that gives it an everlasting claim on the attention of the public Besides us indispensable use in all

avocations, and its constant application in the sphere of daily life, it is also profoundly affecting the whole circle of questions, specularive and practical, which have agitated

of the congarine

reproduction of which

is presented obove

the minds of men for generations.

"Whoever cares to know whicher inquiry is tending, or how opinion is changing, what old ideas are perishing, and what new ones are rising into acceptance—briefly, whoever desires to be intelligent as to contemporary movements in the world of thought, must give attention to the course of scientific inquiry.

"Believing that there are many such in this country, the Popular Science Monthly has been commenced with the intention of meeting their wants more perfectly than

any other periodical they can get. Popular Science MONTHLY will make its appeal not to the illiterate but to the generally educated classes. Our pages will be adapted to the wants of these and will enable them to carry on the work of self-instruction in science."

Year after year those policies have guided the editors of POPLEAR SCHENGE MONTHLY That old purpose s in the planning of every issue. And instead of the few hundred readers of 1871, we now have hundreds of thousands in

every part of the world.

POPULAR SCIENCE MONTHLY is conducted today just as it was fifty-four years ago, but the fields of science and the interests of mankind are seen to be far wider than even Mr. Youmans dreamed of half a century ago. From thousands of laboratories and factories and shops have come inventions and dis-

coveries to make the daily life of human beings easier, richer,

services offered our readers

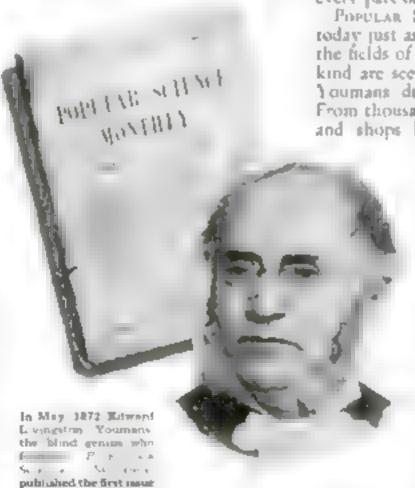
And to keep pace with this tremendous progress, Popular Science Monther has been enlarged and improved. Where one man once made the magazine, it now needs many. A large board of editors and consulting scientists, our own laboratories and testing divisions, and an extensive research department, all contribute to the

IT IS the function of Popular Science Monthly to report and interpret great advancesto explain just how they affect you and me. Pictures have been added to make vivid the tre-

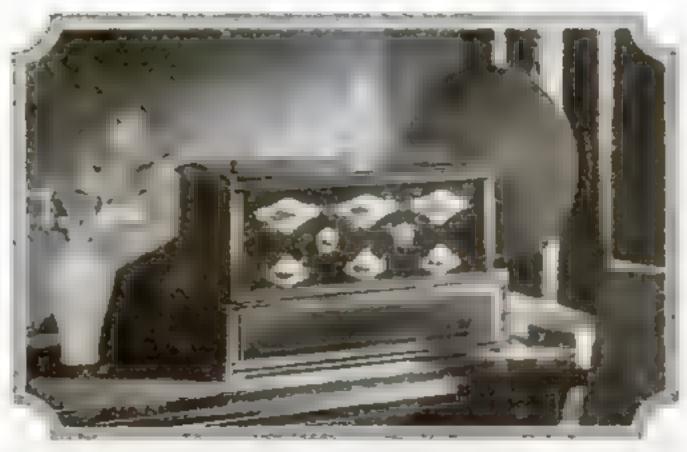
mendous drama of science and its effect on civilization and the lives of men. And that we may be of service to the largest possible number of people, we have reduced the news of science to words that any intelligent person can understand without effort. We have forced those exclusive folk—the scientists—to share the knowledge, once shared only with each other, with all of us

On this our fifty-fourth birthday we have reason to be proud of no one accomplishment more than that the high priesthood of science is no more. Science has been made graphic, understandable and interesting to the average man and woman. We have kept the faith of our

founder. - S. N. B.



Our Founder and Has Piret Issue



Why the Synchrophase

Appeals to the "Fan"

HE, more than any one else, understands what Grebe quality means. He best realizes why Grebe construction is reflected so surely in the superior reception of the Synchrophase.

The Grebe Synchrophase, built to satisfy the "fan", has quickly won first place in the opinion of the average radio user.

> Ask your dealer to show you what Grebe reception means.

A. H. Grebe & Co., Inc., 109 West 57th St., New York Factory: Richmond Hill, New York Western Branch: 443 So. Son Pedro St., Los Angeles, Cal

The Lompson name WATE and WBOO alta law wave re-broodcaring stations mobile WGMI and morne WRMI



All Grebe apparatus is covered by patents granted and pending.







ft in written.

"A perfect wase never came from a bad potter a wheel

When one realizes its origin the superior re-ception of be Synchrophase is not to be wondered at





POPULAR SCIENCE MONTHLY

SUMNER N. BLOSSOM, Editor May, 1926



An Untold Story of The Greatest Sea Rescue

With the life-saving apparatus helpless against the fury of an angry ocean, the Roosevelt's engineers invented ingenious devices to save the stricken crew of the sinking Antinoe

By EDGAR C. WHEELER

remen and starving sea men ching desperately to the storms wept deck of the sinking temperateurer, ladance, Bonts were gone, or gines and fires were flowled; and the lee mit was deping under. Dombed hands grasped for hold against and Atlantic, gale-driven combers that surged up augrity to lap them and the sea. Yours that tred to most were lost as the lawd of woods and driving sleet

Two knodeed yards away was the duo of three of a ship. For three days now the United States after President Roberell had shood by. For three days the resement had tried every remove known to marmers in feach, effects to reach them.

To the haddled group on the deed of, it seemed as if the full wrath of the Roaring Earties in ist sorely carry them to death

Suddenly above the storm, carge the faint booming of a gin. A Disk rope samped down across the careening deck. The stricken scamen ac ged it eagerly with new strength. Together they tagged at it. As they policil an empty lifeboat at the end of the line moved slowly toward them across the forming sen. Now it was 100 feet away. arm or is twenty feet. A little more and the boat's stort painter towns in the thin line was made. fast, would be within their One final frantic tue. reach. The rope felt slack in their hands. The line had parted.

Everyone knows what happened them; how, a few hours later, the entire crew of the Intonic finally was taken off in hours anamed by heroes of the Howevelt a crew. The whole world was stirred by the maginficent rescies and two continents yield in honoring Captain Fried and his men



Faced by Emergency, He Become an Inventor

John Turner chief engineer of the United States liner Provident Roosevelt who met out of many emergencies in the thrilling rescue of the Antonne a crew by inventing what has proved to be an important improvement in apparatus for saving lives at sea

> for their victory or that grow four-day battle with a thundering tempest.

> But beland the shooting of that one life line after a dozen other attempts had failed—even while it brought only heartrending disappointment—lies a remarkable chapter in the story of the rescue, a

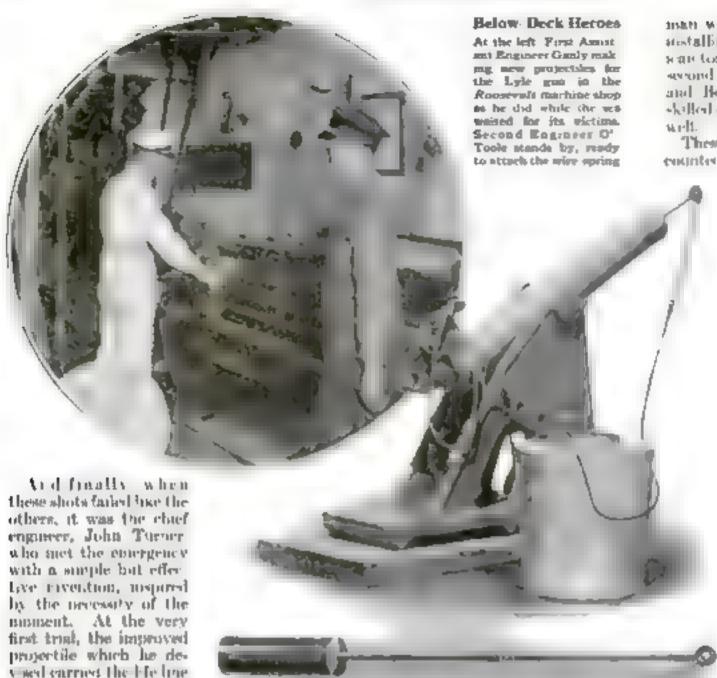
chapter which until now has remained virtually untold. It is a story of ingenuity and resourcefulness seklom equaled; of men trained to do things and make things with their own hands, who in a few tense hours became inventors and mechanical genuies to meet a great emergency. Its beroes were below-deck heroesstout-hearted engineers, muchinusts and firenten, begrinsed with the oil and gream of machinery, who labored hour after hour in the din of the straining engines to make the rescue possible,

WHILE Captain Fried maneuvered haship perilously close to the foundered Antenor jockeying for positions of vantage, it was the sure hands of engineers on the throttles down below that sent the Roserett plunging forward at his briding or pulled it up sharply on its bannehes. In those four days of maneuvering, they responded to more bells from the bridge than ordinardy are sounded in two years in and out of port,

While before above were risking and loang their lives in futile attempts to launch their lifehosts, the hands below were skilfully putting thousands of horsepower through one of the most terrific tests that manne engines ever have been called upon to meet. Time and again, turbines, whiching 1800 revolutions a minute, were thrown from full speed ahead to full speed astern. Yet never once were the

great engines allowed to falter.

Again, when the first shot lives from the Lyle life-saving gun mapped in mid-air, and the supply of projectiles was exhausted, it was the engineers who turned to the machine shop and there fashioned new projectiles from rough steel.



Two Simple Changes That Improved a Noted Invention

Above the Lyle gast, loaded with the emergency been present is ready to be fired. Below the new projectile showing original eighteen do it approache marked by dotted circle lengthessed to four feet with Turner's spring

quarter of a trile beyond.

How this line, where
letched to an empty lifeboat, severed across the
tey ruit of the Intone,
plready has been tool

sq mrely across the deck

of the Interior and a

Yel even though it did not lead directly to the saying of lives, the great fact remains that in the most critical moment to one of the most thirding of all seasones there was invented an important improvement in apparatus for saying lives at sea—the inspired idea of a handy-man.

And the President Romerst's chief engineer is just that—a handyman, A alightly built, soft-spoken, reticent man of 37 years, he has been making things with tools and machines ever since he was fifteen, an apprentice in a machine abopt.

As A boy, his greatest pleasure in space hours was to build toy steamships with real toy engines, and make them has been the making of hately devices among them such things as an ingerious wave-driven pump that automatically bales a small boat at anchor a quick heating kettle that bods the morning coffee in a munite a centrifugal machine gun driven by a gas engine a device for measuring the distance of airplanes with beams of light.

And, with all, he is a master engineer, trained in an Euglish university, and in the rougher school of experience. During the World War he made ninety six trips through the submarine some. Many times

his resourcefulness and accentive ability.

Once for example when the sexteen men piston of the President Rosserett's steering engine broke, he quicket insprovised a new poton from the lifting gent for a high pressure turbine. At another time, on the steamer Philodelphia, a broken main crack-haft found how i of at all at a loss. He simply divided the power plant in half, and drove his stop with half a crack-haft, with two engines instead of the four

His four assistant engineers on the Roomed are men of much the same calliber James Ganly first assistant, a young

Made Rescue Possible

The engine room of the Remoterels showing dials flashing or ders from the bridge faring the thrilling result. At the estreme left. Third Engineer Dully is seen relaying the orders to the fire room. At the wheels are Goody and O'Toole.

man who during the war had charge of austalling engines on twenty five American torped chairs. James O'Toole, senior second. Joseph Dhizon, purior second, and Hernard Duffy third all of them skilled engineers and expert machinists and soll.

These were the men Captain Fried counted on to carry through when, that

Sunday morning in January, he received the S O S of the follows and mammoned his chief engineer to the bridge. Through derving holt and snow the Honerell was laboring. Hence seas were dasting form across her decks. The prospect of a resone is such a storm was enough to distinct even the bravest of men.

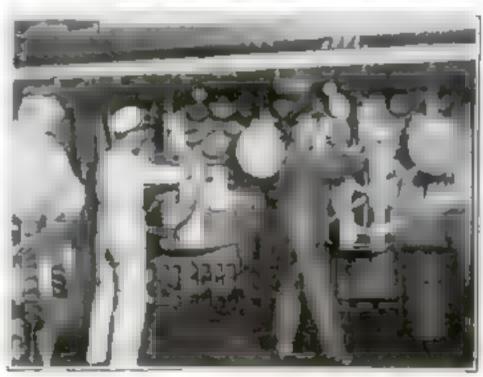
"WE ARE going to her," Captain Fried told his engineer. "We'll want all the speed we can get and we'd need a Unindeed native."

Down here we went out orders for morder watch. Sceping mention it ed from there bunks and horned down attention starways winding into the august room tweaty feet oclow the water lass. Yellow jets of through oil apart and rouged under the bosters, thruttles were opened wide, and the Provident Rooserelt gaided by radio compass, thus not to the rescue with all the power that was in her

At roots the Antroce was suglited. The Research should be to the was ward whole tediest pumps poured oil on the forming waters. Two hours after the Lyngan severed for just much a researce.

was rigide ready on deek to fire the first shot live to the "Onlawer"

This little prortar about a yard long, points its two and one had mely missle starply upward. The entire gion is stationary of the deck so that it is necessary to any the slope moderal of the weapon. Its projections a steel build a foot long, it is one end of which is fastered a slender steel red or spirable. This spirage choicing a waterextro which is fastered the end of a marrial rope, about the flockness of an





remary planets to make be ket at so of longs. The property is inserted a many with the aparale and line protrading from the amazie. A charge of powder set off by a pruner fixes it.

Yorl now, while searching eyes on the bridge peered through the dark curtain. of sleet, seeking arm at the bull obscured mark. The engineers below were respond-

mg to bella which kept nound tig in quick micension as the toming ship maneuvered into position. With gaze fixed on the duly that indented orders to a graphed from above, and w hands clutching the engine of trol wheels, they moved with clocklike precision to the coanmands of poorters that told the o "slow"—"full alteral "stop "peverse

"THE little gun morned. But as the projectile ped from the muzzle, rt left the rope behund! The quick, lashing jerk of the bullet had mapped the rope like so much thread? A second shot, then a third met with like failure.

" Ul three projectors gone, was the word passed down from the deck.

"We'll make some more," the chief engineer flashed back.

A few quick measurements, and he harries into the rear Three from a day of s a lars leached the of the cor rect diameter and cut it to length for a twelve-meh bullet. For the spindle he turned down a length of boring bar threaded it at one end, and inserted it in a threaded hole bored in the projectile On the other end of the spindle he welded an eye, In the short space of half an

hour the job was entirely completed. Through the night and the next morning, while the Roserest drifted about in search of the Automot, which had been lost in the darkness, the engineers worked wit nort rest by turns in the machine shop,

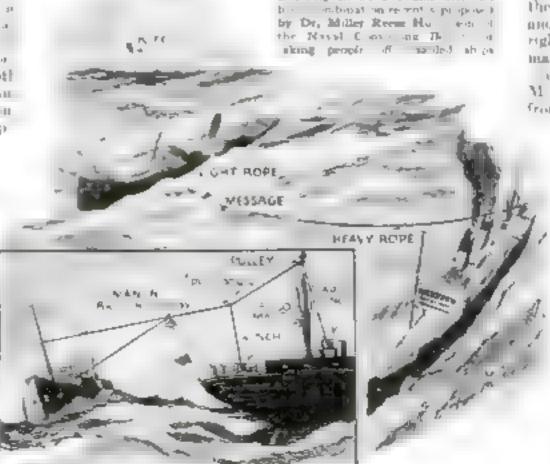
making projectiles. When the stock of two-and-one-halfas h bars was exhausted, they took three-such stuff and turned it down to the right thickness. In all, they manufactured thirteen of the comensule" projectiles. M and de, other mechanics from the engine room had

> turned electricians and were stringing thousand-eandlepower lights around the sides of the President Howevell making a 100-foot error of day right brightness about the ship.

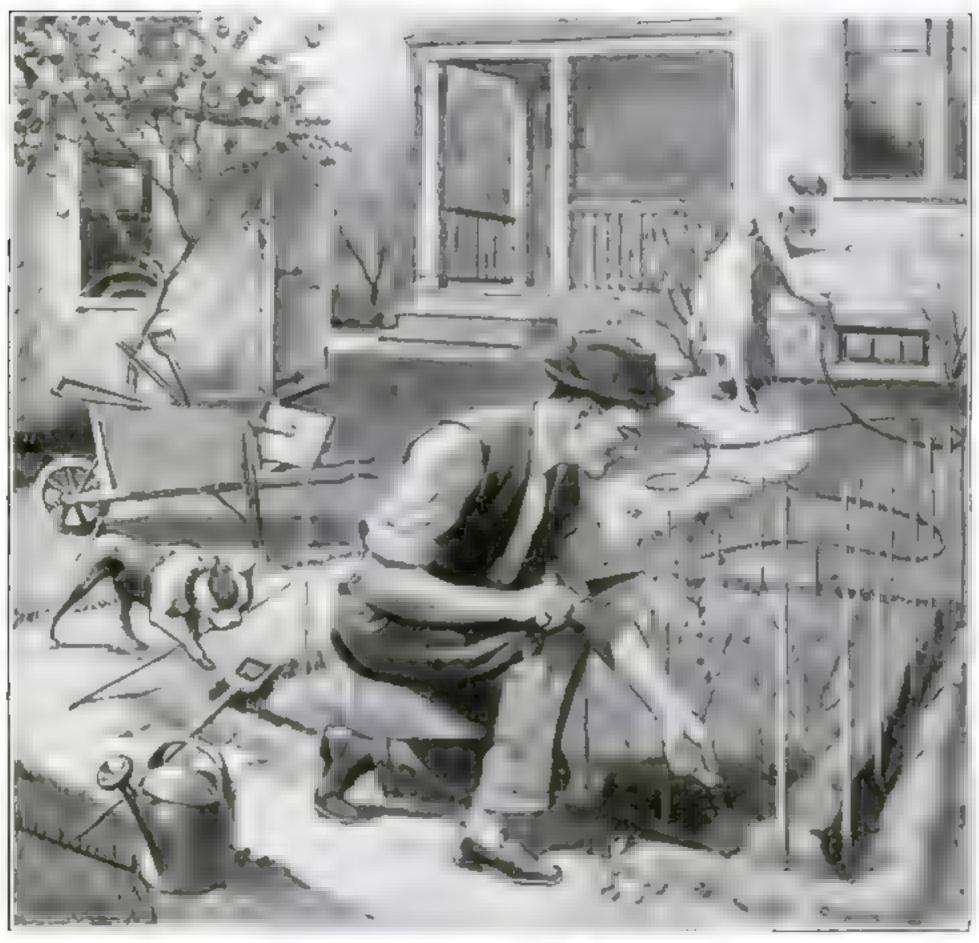
On the third day, after two of the Rooserelf a men had been swept away in a futile attempt to launch a lifeboat, the men on deck renewed their efforts to shoot a line ACTORS. Ten more shots were fired - and every one of them Continues on page 113)

New Life-Saving Moth of

Disa ng about hite and bice ica



What's Wrong in This Picture? \$1,000 CASH PRIZES



DMN and Mary Newlywer have decided it is time to get "beir I garden started. So taking advantage of the fine weather they have begun enthumestically, if not shifully, to prepare the ground,

Are they going about it right or are they bungling the job? If they are making mistakes, what are they? The arrest trat deliberstely made a few errors in drawing the picture. Find them, slav

IRE YOU quick at observing things azound you? Are you asway you the mert to see that everything is done right? Here is an opportunity to prove that you really are and in so doing to will one of the cash prizes Popular Science Monthly is offering in its fasconstant series of Picture Contests.

The contests began in the March numher, but you can start now. Each contest is a separate competition and complete in tiself. It is not necessary for anyone to have entered the preceding competition.

The idea is this. In each issue you will find a picture in which John and Mazy Newly wed are the principal characters in a attle home comedy. John and Mary are mexperienced but that does not deter them from undertaking odd jobs around the house. Naturally like everyone else, they have to learn by mistakes. And they make many. In addition, for good measure, the artist draws a number of things in each picture incorrectly. Your task is

to find all mistakes made either by the Newlyweds or by the artist.

Cash prizes amounting to \$1,000 will be awarded to those who point out the greatest pumber of errors in this mouth s parture and who also give their reasons in the clearest and eleverest way. The prizes are sixty three in number, so you have that many chances of worring.

The contest is open to everyone, and you can submit as many sets of answers as you wish. If you already have won a

prize in one of Popular Science. MONTHLY's precessing contests, you still may compete in the present one. Prixes for each month's contest will be aunounced in every case as soon as possible.

Before you begin to study the picture this month, be sare to read the rules of the contest carefully. Then examine the picture. closely, going over every detail thoughtfully. As you come upon an error, make a note of it Ask members of your family, friends, and neighbors to tell you what tacy consider wrong in it. If you think you lack knowledge on one or more points, consult someone who is experienced

When at length you can find no more mistaken, make out a list of all you have found and give your reasons for calling them wrong. Remember to number your anawers. Use pen and tok or type-

writer, and write on only one sale of the paper. Address your entry to the Pictore Cordest Editors Popular Science MONTRLY, 250 Fourth avenue. New York City All answers for this month's contest want be maded not sater than May 30.

If you wish to submit additional an-

Here Is the List of Prizes Will You Win One?

POPULAR SCIENCE MONTHLY is awarding \$1,000 in saxty-three cash prizes for the best answers submitted in this remarkable Picture Contest. The cash prizes will be distributed as follows:

First Prize \$	500
Second Prize	100
Third Prize	50
10 Prizes, \$10 each	100
56 Prizes, \$5 each	250
Total Prizes \$1,	860

swers, you may do so, but send them in as complete separate entries. Where more than one set of answers is entered, the judges will recession earth not us a reparate entry complete in itself

The three judges who decide on the winners are Professor Collins P. Bliss,

director of the Popular Science Institute of Standards and bead of the department of mechanical engineering, New York Univer-aty Dr. Hazen G. Tyler, associate director of the Popular Science Institute of Standards and associate professor in experimental engineering. New York University, and Alexander Senauke, M. E., E.E., radio enganeer of the Popular Science Institute of Standards. Their decisions will be final to all cases.

The first two Picture Contests in our new series luive evoked great enthusiasm among our readers, judging by the expressions we have received from thousands of them. We were practically deluged with the flood of contributions for the first contest. And already we have had a legion of entries for the April contest.

In next month's some, another picture will appear, fully as curiosityprovoking as this month's. If you failed before, don't be discouraged. You may score heavily in this one. But whatever your success, you will gon a fund of practical knowledge from John and Mary Newlywed's mistakes that will repay you.

The Rules of the Contest-Follow Them Carefully

Each month, until further notice, 1. POPULAR SCIENCE MONTHLY IS printing a picture of John and Mary Newlywed doing some simple job about the home. Bach picture shows John or Mary, or both, doing one or more things in the wrong way. In addition, there are a number of deliberate mastakes by the artist in drawing the picture. You are to tell us what things are being done wrong and what things

are drawn wrong in each picture, and why they are wrong.

2. MONTHLY will sward POPULAR SCIENCE \$1,000 each month in sixty three cash pruses for the best answere giving the greates number of mistakes in the picture. These prizes will be distributed as follows First Prize . . , . \$500 Second Prize Third Prize Next 10 Prizes, \$10 each Next 50 Prizes, \$5 each 250 Total Cash Prizes each month

Prizes will be award-

J. ed to those persons who point out the largest number of actual mistakes found in the picture and who present their explanations of the errors in the clearest and most skilful way. Actual mistakes shall be construed in all cases to mean mistakes appearing in the picture about which there can be no question in the opinion of the judges. In case of ties, the full amount of the prize will be given. to each typing contestant

4. Answers to each picture must be mailed or delivered to the offices

of POPULAR SCIENCE MONTHLY BOL later than the thirtieth of the month following the date of publication of the megazine in which the pleture appears. Thus, to maure consideration in this month's contest, answers to the picture in this month's issue, published April 10, must be mailed or delivered

contestant may submit as many seperate entries as he desires. All entries should be addressed to O. the Picture Contest Editor, Poru-

LAR SCIENCE MONTHLY, 250 Fourth

evenue, New York City. Name and

changes or corrections will be allowed

in any entry after submission, but any

address of the entrant must be written plainly on each page of the entry. Entries with insufficient postage will not be accepted. The publishers cannot be responsible for delay, loss, or mon-delivery of entries. No contribution entered in this contest will be acknowledged and none will be returned. No letters of inquiry regarding points covered in the rules can be answered.

> You pay nothing. Just 7. you pay nothing, prove your knowledge and observation. You need not buy Popular Science MONTHLY to compete, You can borrow a copy from n friend or you can examine one at any office of POPULAR SCIENCE MONTHLY or at public libraries free of charge. Rech contest is open to everybody, except

employees of POPULAR SCIENCE MONTHLY and the Popular Science institute of Standards and their fam-

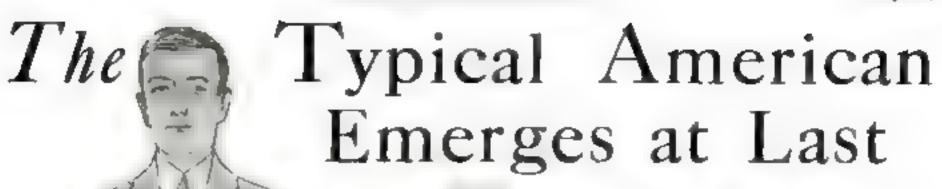
8. Institute of Standards will act as judges and their decisions will be final. Acceptance of these rules is an implied condition of each entry

Another Contest in June

THE fourth \$1.000 Picture Contest of this A fascinating series will appear in next month's issue. Watch for it. Other similar contests will appear in succeeding issues of POPULAR SCIENCE MONTHLY. Each will be a complete contest in itself. So, if you should fail to win a prize in one month's contest, you still have as good a chance as any one else to win one the next month

> not later than May 30. No entry bearing a postmarked date later than the closing date for entry will be considered.

> Answers may be submitted on any kind of paper, but they must be typewritten or written in ink, and on one ade of the paper only. Each error must be listed esparately and numbered. No



The American type Or Medicks finds as the taffest of at larger groups of white people is physical and mental bitters he has not suffered by the flood of intrasputation

erowded with peoples of every nation and a certain type of man came along, you would say involuntative. "That was American." Certain things in the way he looked and acted would cause you to recognize him According to Dr. Hells ka.

one of these characteristics is height. The typical American is the tallest of all groups of white people. In the wide spaces of a new country, he has had room to grow, it's average beight is about five feet, it is inches.

The typical American is naturally slender. In comfortable middle age he may develop an automobile paunch, but when a voith be is little and anemy. His legs are long and they move gracefully. He weighs on the average about 150 pounds.

Hair—usually brown and straight. Blend or curly-haired Americant stand out in a crowd because of their ranty

A mixture of many bloods shows in his eyes. They are light in color, either a hazel, or, if blue, mixed with brown.

The head of the typical American is perceptibly larger than those of other nationalities. Facial characteristics differ according to occupation. Some whose ancestors were farmers or laborers, have jaw and check bones that are inclined to protrude, with skin drawn tant over them. Abraham Lincoln is a pronounced example of this type. Those with white collar jobs have more rounded features, with bones less pronouncest.

The typical American face is frank, healthy, intelligent, with medium high forelegal rather long more rare bing and broad, and mouth moderate in width His arms, hands, and feet are relatively somewhat aborter than those of other nationalities. The chest is about equal in breadth but not quite so deep as in European impregrants

Many Bloods Fused

into Distinct New

Kind of Man-Tall,

Slender, Energetic

The character of the American is as pronounced as his appearance.

"The main characteristics of the American type," Dr. Hedlicks explains, are, in general, frankness, openiess, yet alrewdness, energy and persistence, with little sent mentality or affectation as a general rule, and with relatively fear extremes in act, in."

MOTION-PICTURE directors, following asturbon rather than the measurements of anthropologists, have int upon virtually the same type to represent America. The hero who usually is picked to represent the good old U. S. A. is exactly the tail energetic, deternimed-looking fellow that Dr. Hedbeks describes

In arriving at his conclusions, Dr. Hellicka examined more than 1.500 adults, both men and women. These were descendants of what he early stock of America, "that is, the early stock of America,

Many American blood has deteriorated through the affire of immigrants. The Washington investigator says that his studies prove the contrary. Ever children of immigrants who were undernized or under the standard of mental and physical fitness have developed aimst wholesome American surroundings into sturdy, quick-on-the-mark individuals.

THERE is such a thing as a typical American. Dr. Alea Hidbicks. noted anthropologist of the Smithsonian Institution, Washington, says he has found him.

Almost once the Pilgrums landed, we have been in doubt on the subject. We could reach down in the melting pot that is the United States and draw out almost any type—a broad-shouldered Briton, an olive-skinned Italian, a round-faced Armeman, all Americans by birth and breeding. To say which best represented America was a puzzle.

But now after fourteen years of careful measurements and examinations, a scientist says that, although our bistory is short, there has been time for all the different types to fuse. Out of them all, be finds, is emerging a new type of man, distinct from those of all other lands. Within 200 years, he believes, this type will be clearly developed into a characteristic American race distinguished by its virility and energy.

Even now, if you were on a street

How a Famous Artist Became One of the World's Greatest Inventors

He Lived Two Great Lives

By ROBERT
E. MARTIN

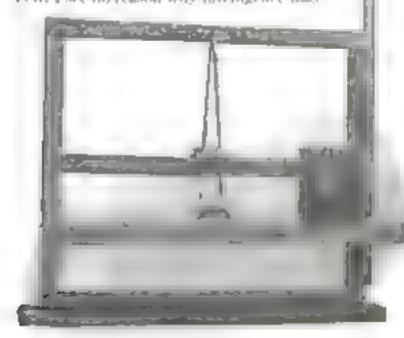
LMOST a bundred years ago, as the packet ship Sutly zode the sea from Havre to New York. a famous American artist sat at diaper with a group of dosbug ushed pussen-gers, among them the I inted States Minister to France. The conversation turned to electricity, the new "flood ' the stronge mysteries of which were arousing the in-

terest of the world. Benpanum Fennkim and has kite, Ampere and his experiments with the electromagnet, were mentioned

"I should like to know" spoke up one of the group, "whether the flow of elec-

"Not at all," replied another of the company, a well-known scholar from Boston. "It is quite established that electricity passes instantaneously over any known length of wire." And he reculed Franklin's experiments in which he had observed an instantaneous spark at the end of several unles of wire in a circuit

"Well, if that is the case," chancel in the activit, "if the presence of electricity an be made visible in any part of a circitit, I see no reason why intelogence may



Couriesp Western Union Talegraph Co.

The World's First Telegraph Instrument

Mone's first crude model telegraph receiver. As the electric circuit was opened and closed, as electromagnet caused a pencil to move up and down, making data and dashes on a ribbon of paper moved by clockwork



"Well. Captain," and Morse on the packet ship suched New York. If you should here of the telegraph one of these days on the wonder of the world presember the discovery was made on board the good ship Sully." This happened about 100 years ago

not be transmitted instantaneously by electricity."

No somer had the words left his bps than Samuel Finley Breeze Morae realriest with an overwhelming thrill that he had hit upon the secret of a tremendom invention. Like a thunderholt there flashed upon hun the revelation of an astounding new marvel of communi-

ration, one destined to link the ends of the carth.

The significance of his words apparently passed over the heads of his fellow passengers. They went on with their conversation as if nothing unusual had happened. But Morse was electrified. Absuptly he left the table and went on deck. There, while the waves of mid-ocean spanked the ship's sides, the instrument that should write down the thoughts of men at a distance took shape in his mind.

IN AN instant Morae, the great artist, at the age of 41, was transformed almost miraculously into Morae, the great inventor of the telegraph. In the first hour of that discovery, his idea unfolded before him from beginning to end. His thoughts run something like this:

"A current of electricity will pass along a wire in stantaneously to any distance.

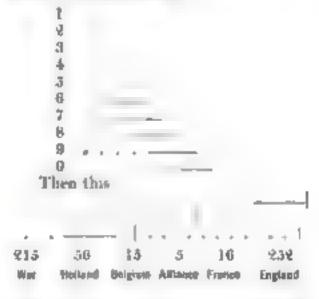


The Inventor of the Telegraph

Samuel Finley Breem Marse, as he expected shortly before his death at the age of \$1. This is a reproduction of a picture of the inventor published in the first issue of Postulas Science Monthly, May, 1871

If the current is broken anywhere along the wire, a spark appears. The spark will be one sign; its absence another; the time of its absence another. These three signs I will combine to represent figures and letters, words and sentences. If electricity can carry these signs tea notes, I can make it carry them around the world?

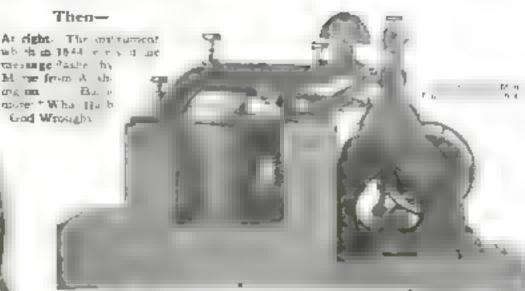
HE deew from his pocket a little scratch book in which he was accustomed to make aketches, and began to mark down a series of dots and dushes. These be arranged in ten combinations, each representing a numeral, the numerals to be combined to represent words, What he wrote was this



That was the world's first dot and dash language; the first beginning of the Morse code, the beginning of electrical communication which was to lead to the telegraph, the telephone, radio and countless other wonders that have made possible the world we know today.

As the slup sped toward America, Morse spent sleepless nights developing





-and Now

At left. The remarkable automatic typewriter receiver used today in the 7400-mile circuit be treen London and San Francisco. On a ribbon of paper the machine points he thereage in instantiationals response to an operator a distance of thomsands of miles away

his idea. His mind was on fire. He had little if any technical knowledge of electricity; yet he had been keenly interested in its mysteries ever since the day when, as a young student, he had clasped hands in a circle with other students at Yale College and had felt the tingle of an electric shock pass through his hosty. In a general way he was familiar with the operation of the battery, the electromagnet, and other important discoveries

NOW he took these separate discoveries as he found them and worked them over in his mood into a practical system of sign writing at a distance. Instead of an electric spark to produce his dots and dashes at the receiving end of the wire, he would use an electromagnet to move a metal lever up and down as the electric circuit was made and broken. In his acatch book he drew little sketches of the matriments and

wires he would use. These he showed to he fettow passengent, who raised their brown skeptically as he tried to explain his ideas to them.

in electrical acience.

At last the Sutly arrived in port, and Morse west to the skipper, Captain Pell, to say farewell.

"Well, Captain," he said,
"if you should hear of the
telegraph one of these days as
the wonder of the world, remember the discovery was
made on board the good ship
Sully."

These prophete words marked Morse's achievement as one of the most extraordinary feats it all the lastory of invention. Seldom, if ever, has an inventor so completely grasped the full aigmifeance of an idea at the moment that when was born in his mind, or so completely foretold its successful fulfillment.

Yet in his supreme confidence that he had brought forth a new wooder of the world. Morse little dreamed of the years of struggle, poverty and better discouragement he must pum before his invention could be put into practical service. Where other inventors have merificed all in the struggle to bring an idea to perfection. Morse's great battle was to "sell los virtually completed alea to an unbelieving and scoffing public. To this purpose he accrificed fame and position, already guided in another field, and devoted a dozen years of heart-breaking labor.

The extraordinary thing about Morre is that he was a man who lived two distinct lives, and who clumbed from the battom to success in each of them. In his life as an artist, he began as a strolling "peddler," barely keeping clothes on his back and food in his stomach by punting portraits of New England country fosk as he wandered from village to village. In less than a score of years, by dogged persistence, he became the foremost

portrait painter in America, before whom sat presidents and generals and statesmen, and whose works, as head of the National Academy of Design, were acclaused at nome and abroad.

Then, just at the moment when he reached the height of faine as an artist, just when he was returning from triumples in Europe, with bright prospects for financial case and still eight prospects for financial case and still eight causes him to renounce all he had gained and begin again this time as an inventor with a great idea.

IN THIS second life of his, however, he called to his aid a wealth of valuable experience from the first. As a struggling artist, he had mastered the lesson of overlasting perstatence. He had learned that perfection comes only after countless trials and failures.

Once, for example, while he was a young art student in London, he carefully finished a deawing which he intended to offer to the National Academy for admission. He showed it then to one of the great English masters of the day, Benjamin West.

"What do you think of it?" asked young Morse hopefully

The master artist examined the deaving closely for some moments

"Yery well sor, yery west," he so the finally, "Go on and finals

"But it is finished," said

"Oh, no," West answered.
"Look here and here, 'pointing to a number of unfinished places that had escaped Morse's untransed eyes.

Somewhat disappointed the young actist took the drawing back to his todgings, where he his over it for a week. Then be returned. This time the muster was lavish with his prace.

Very well indied, or " he said. "Go on and finish it."

"Not yet See, you have not marked that muscle, nor the articulation of the finger souts."

Again Morse spent days retouching his picture.

Very clever, indeed," said West when he came the third time, "Well, go finish it."

"I can't fluish it!" ened Morse. (Communed on page (30)

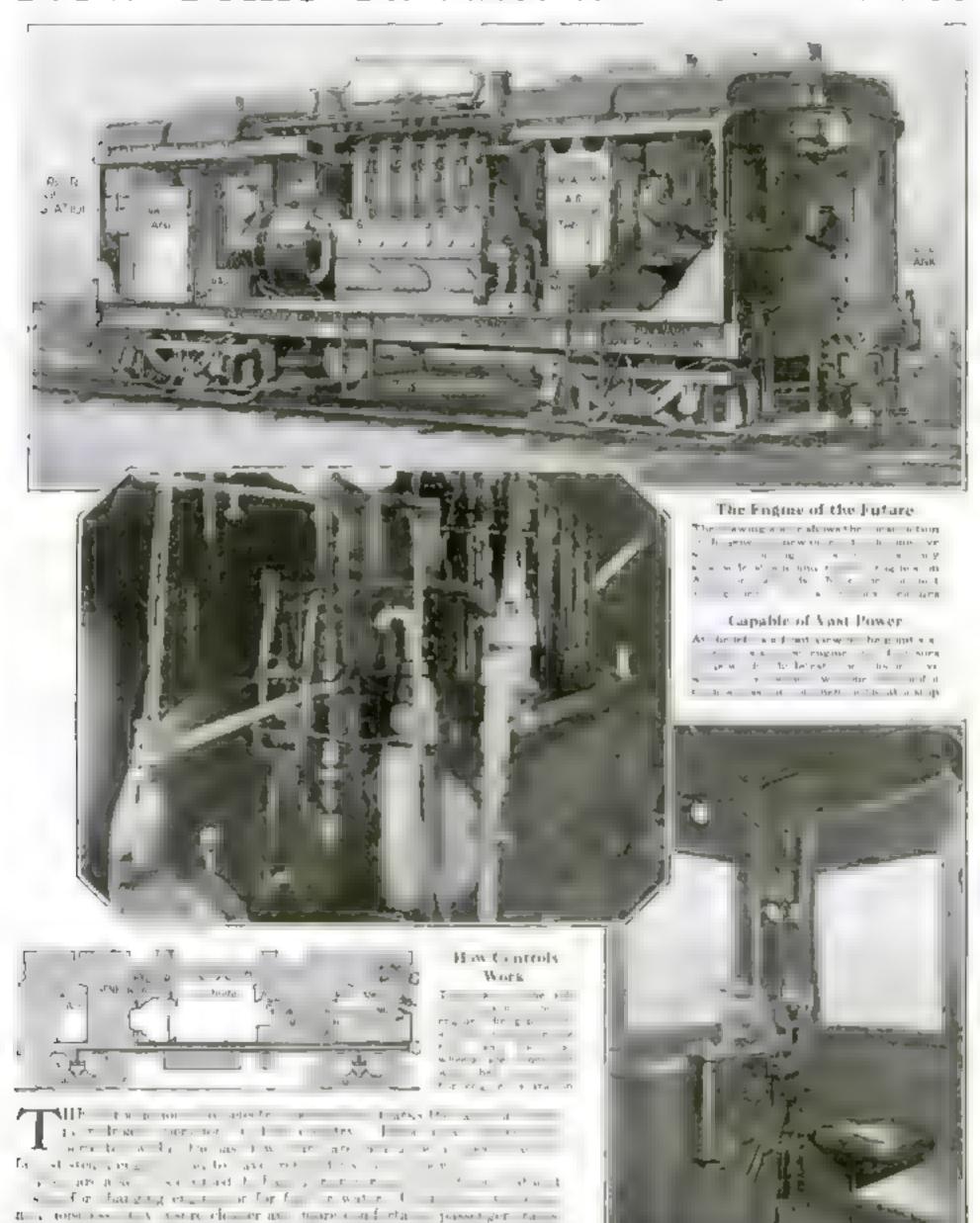
From Our First Issue

FIFTY FOUR years ago, shortly after the death of Moese at the age of \$1, the first issue of Popular Science Monthly, appearing in May, 1872, paid this prophetic tribute

"Professor Morse has completed his career and taken his place in the past. He belongs now to memory and to fame, and his name and work will help to save our age from oblivion

"After a few thousand years, when the infenor races of men shall have disappeared from the earth, except perhaps a few samples preserved as antiquarian specimens, when civilization has overspread the world, and the telegraph system has become so universal and perfected that any individual will be able to put himself into instantaneous communication with any other individual upon the globe, then will the name of Morse, one of the great founders of the system, be more eminent than any upon whom we now look back as the illustrious of ancient times,"

Now Come Oil-Electric Locomotives



Super a lower and proper on some appropriate from strong bound we are consistent us as a real of country sets on the Control Karleya Now Jersey, in which a sixty-top off-electric engine handled, in a given period,

11,000 more lons at a fuel cost of twenty percent less than a steam engine.

one had, and each engine will last twice as long as a steam locomotive.

The use of these engines, it is said, will reduce maintenance rests

Simple and Compact Control

The control station of an oil-electric locomotive. The engine throttle is seen in front of the window, with the motor central just below for convenient operating

It's a Game of Glorious

THE wonder home, Man-e'-Wer, greatest of all American racers. This picture shows the magnificent animal in his prime, galloping through a morning workout—an important part in every thorough hred's training. Man-e' War has been called the finest race home in history; yet even this phenomenal winner was defeated once, unexpectedly, by a home called Upact

How the Science of Making
Race Horses Often Is
Upset in the Stern
Test of the Track

TITLE thorought reas, costs gleansing with sweat clocks of earth and sworts of districting beneath their thundering hoofs, straining pasting vet moving with rhytique grace as their spaces devouring leaps enery them down the yellowish ruston of track,

Stinited, hard-fazed powers in blocked and case of bribant sites, benched ake morkeys on stocks on the very necks of their mounts, their spare bodies bobbing violently up and down as they urge the horses to greater speed.

Hoars and screams from the throats of hysterical thousands growing in swift trescends to a deafening blast as the held sweeps by the next pageds that shelters the judget and marks the finish of the race.

Then, anddenly-silence,

For a moment you hear the gentle suppose of flags on the grand stand roof. Then comes a hum of conversation, and the rustle of paper programs, newspapers, "dope sheets" as the nabokers discuss the event just run. The horses, brought to a stop a quarter of a nule or so beyond the finish line, turn and trot leasurely back to the judges' stand, where the juckeys salute, dismount, "weigh in," and pass back to their quarters. Hostlers throw light blankets about the horses and lead them to the barns. A band blares forth in a lively tune.

That's horse racing, famous "sport of kings," the most romantic and glamorous game of all—as you see it from the grand stand. Twelve thousand times a year,

A Tense Moment

A typical swater during one of the thousands of house races which each year at tract stulistudes of screaming, hysterical apectators

approximately, such scenes are enacted on recognised tracks in the United States Canada. Mexico and Cuba alone,

But from the grand stand you see only are side of taking—the speciacular side lichned by an carnest, studious group of men—becoders, trainers and owners—to whom horse facing is a science, a field for constant research and experiment. With them, racing goes far beyond the bustle and existement of a race meeting to quiet farms where assumals are bred scientifically and trained systematically.

THE study of engence and heredity is an every by part of their business, and some of them can trace the ancestry of their charges back beyond Bully Rock, the first thoroughheed to come to America, and other famous horses, imported into Virginia from England long before American independence. With justifiable pride, they will tell you of the proud lines of British and Colonial ancestors from which this or that horse is descended.

With these men, the cardinal principle of the science of borse breeding is stated readily. Mores which have been winners and come from lines of winning borses are



This ungainty little new born filly comes from a tree of womers from Mercia above by Purchase, a famous racer. Whether the baby will be a winner too, is one of the uncertainties of the game, but so any event she will be coddled, petted and trained as all racers are

mated to horses that likewise come from winning lines. The theory is that the peogeny should be winners also. But sometimes—very frequently, in fact, horse racing being the uncertain proposition that it is—they are not.

The foals, coming in March or April, make their bow as yearings to the public in the cales ring early in their second summer. Colts and fillies of distinguished ancestry bring high prices at these

Uncertainties

By GEORGE LEE DOWD, JR.

anctions, the purchasers being guided largely by heredity Sometimes these colts justify their heritage, more frequently, though, they do not. Thus, of about 200 well-bred yearlings sold to leading American racing stables in 1974, only about seventy proved themselves "bargams" in their first year of racing last season. Of the rest a goodly number won not a single purse for their pur-Casers.

OF COURSE, these young horses may prove worthy descendants of their noted ancestors in later years of racing, or to time may themselves beget real racers. who will repay their breeders a thousand fold for their investments.

But it is a rash man who will dare basard a prediction as to what a race lorses will or will not do. And it is in this constant, glorious uncertainty that hes the real explanation of the lure of menny. There is an old saying among turfmen that anything can happen at a race track? And anything that is, the in-expected shoes happen said every day?

A few months ago one of the best American trainers prepared a list of one hunfired ways in which the best horse could be beaten in a more. These named from falling to being nosed out at the finish because an excited jockey turned his head as his but blew off

In 1923 a Chicago turfman, William Daniel pickel up 🛦 yearling colf. Master Clurke. at auction for \$1 000. In the following years mining the rolt won stakes and purses aggregating \$95,525, and was acclaimed by some the best borse of any age in the country. But, before the first spring stakes were run last year, Master Charlie developed amound legs and was withdrawn from racing.

Two years ago Mrs. Payne Whitney paid \$15,500 for a yearling colt, Norms, half brother of the abstracts Apon (68) pilita di faca



"Schooling" at the Barrier

A remarkable shotograph showing how young horses see echooled by the official starter to stand quietly behind the burrier while it is down. The instant the berrier is "spring." they loop forward. Sevices can the restless young animale be made to heep as straight and quiet a line se this

> transer's faith by scoring a wholly unlos - 3 for a setory in a \$30,000 stake race. One night go on recounting similar rases almost without end. There was, for example the cost, Playfellow, full brother the great Man-o War, Harry S.

> > for the autonal in Dis hope that he would follow the fain ly unbit of making furf lastery, only to discover that Phylellow's constitution and habite precluded the possibility of Lix ever becoming a high class horse. Before that Samuel C. He-dreth, trainer of Such ra Rancoesa atable, paul \$115,000 for the cost lochcape, son of Frar Rock, three year-old champion of ten sensora ago, only to have Inchcupe develop a skin disrase that made has gent for race g.

Yet, although this nucertaidy of race horses military a on page 1 a 2

The Training Camp

Every sarge race track has an included course where the herers are kept to transing during the winter. These mews of the Rancocas farm in New Jersey show how the track and stubles are housed under one roof. Notice in the ovel picture how these novel paintful stalls line the track



How Large Can a Star Be?

New Discoveries Show That a Sun More Than Fifty Times the Mass of Ours Would Burst into Fragments

By NEWTON BURKE

San which for inclions if years has been lighting and warming the Earth day after day scenic contesting and warming the Earth day after day scenic contesting after day scenic contesting attack in the universe Yet actually our Sun is a relatively unimportant links pulsed of fire compared with some of the vast flaming attack swinging through space so far distant from us that they can accreely be detected with the powerful materiments of astronomy

Just by way of manparason, magne that you could hop into your car some day and travel without stop usdefinitely. At a continuous speed of sixty miles an hour, you could complete a trsp around the Earth's equator in about seventeen days and eight hours. In a little less than five years, you condcover the distance at the same stared around the Sun. But to circle Anteres, the argest star we know of, in your fastest motor car, you

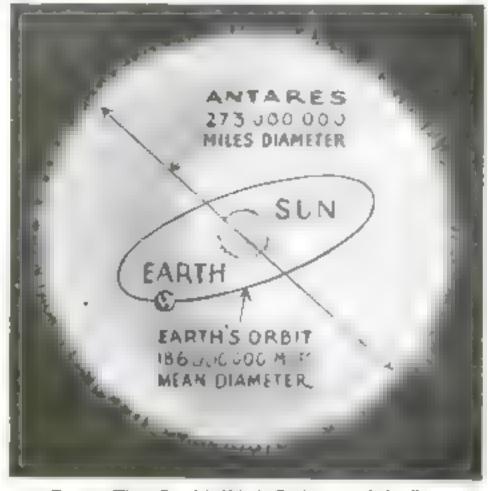
The mancter of Arthres is estimated at more than 274,000,000 miles or more than 274,000,000 miles or more than 300 tripes that of the Sun. And Antares is only one of a number of guest sum. Betelgense and alpha Hercides are almost as large. They are so huge that not one of them could fine room in the vast circle described by the Earth in its path around the Sun.

BALS of fire so enormous as these stagger human imagination. Quite naturally they lead us to ask whether there is any unit to the size of a star, and, if so how large it is possible for a star to be

Asswers to these questions recently have been given through remarkable measurements by A. 5. Eddington, noted British serent st.

A star whose mass is fifty times that of our Sun, this astronomer found, has reached the limit in greatness. Stars of greater mass than this cannot exist they would burst of their very co-currents. Their own pressure from with a combined with the centraligns force of rotation would overbase see the force of gray dation holding them together and they would by apart to advoces of fragments.

In these calculations it most be remembered of course that the mass of a star depends on the weight of materials composing it, and is quite a different thing from volume. Thus, while the great star Antares is hundreds of times



Greater Than Earth's Whole Path around the Sun

Antisect, the largest known star, is just one of a number of giots start, none of which could find room in the vast in its device bed by our Marth in its path around the Sun. To motor around it would take 1 370 years

larger in dimensions than the Sin its mass is within the outside limit of life times the mass of the Sun

Estington's starting conclusions were reached through a study of the light radiation of stars and decauses to means of agenous modern instruments of measurement, such as Michelson's interferometer the spectroscope, and improved photographic apparatus. He learned that in the center of a star whose mans is one



Equal to 6,000 Big Gons

The terrific pressure of the center of the Sunhas been estimated at about 100,000,000 possible to the equary such 6,000 times the breech pressure developed in firing our largest coast defense gue. A star more than fifty tymes the total mass of our Sun would burst and one half that of our Sun, the heat reaches the tremendous temperature of \$.350.000° F. Even a spot balfway between the center and the auriface reaches \$ 905.000°. The pressure at the center is \$1.000,000 atmospheres, or more than 300.000,000 pounds to the square inch—at least 10.000 tones as great as the breech pressure of Uncle Sam's largest coast defense gun

EDBINGTON learned, too, that just as there is a limit to the greatness of stars so also there is a limit to their smallness. A star less tone one seventh the mass of our burs, he discovered, would cause to shine. For the temperature at its surface could not reach 5400° F.—the lowest temperature at which a star can remain visible by light radiation.

Of dwarf stars, there are and obtesty far more than we know of but most of them are reveable to us even through the most powerful telescopes. The smallest ob-

rerved and studied, a distant con parison to alpha Centauri, is probably close to the limit of visibility and gives only the limit of the light of the fain. These dwarfs have dismeters between 1 = 000 and 580,000 miles in length, hence are much smaller than the Sun, was it has a districter of 885,250 miles.

THESE new measurements, randentally, led to interest ig concilions about his Sun. For instance, his culculations indicate that the highest surface temperature the Sun ever reached was also it to 200° F while its present surface temperature is not more than 10 800° this surporting the theory that our Sun is a "dying star,"

That such may be the case, however, need cause us no alarm, scientists tell us, for even if the Sun's energy should continue to decrease at a regular rate, it would take militars of years before it would cool off enough to injure life on harth. In fact, astronomers say the Sun does not get its heat by burning up as we burn coal. Instead, much of its heat seems to be developed by explosions or changes in along of matter compositional.

This, so far as we are concerned, its store of energy as mexhanatable. The Sun has been supplying warmth to its family of planets for probably millions of years and, to the best of our knowledge, will continue to do so for many centuries to come.



Can You Solve the

World's Greatest Puzzles?

Millions Have Tried-Sam Loyd, Famous Inventor of Brain Twisters, Reveals Some of His Secrets

HAVE never met a normal thinking person whose trapp of may site eiess did not lend lant to take at least a mild interest in puzzles. When a man tells me he is atterly indifferent to puzzles. and never tried to solve one. I can only emelade that be is arking in a certain wholesome enthusiasm, without which life is a drah affnir

For while justing against all manner of people at his been impressed on my mind that the successful ones are those who have a na iral familty for solving puzzles. Life is fill of puzzles, and we are called upon to solve such as fate throws our way. We are constantly propounding and solving parales without resisting it. Exactly the same faculties that

trus ness problems engage are brought into act or in parale solving.

To set uside a certain type of maid as of the puzzle solving kind would be a rash assumption. Puzzlers are recrusted from all walks of life and no particular profession, trade or occupation provides a larger quota than another.

Some of the world's great figures in science and letters have not been too. proud to affix their names in authorship to puzzles. Famous scientists like Newton, Euler Tyndall, Cardan, Huxley and Herschel, and connect writers such as Byron, Voltaire, Ma-

By SAM LOYD

The passles of Sam Loyd are known throughout the English-speaking world and for more than thirts years have appeared daily in a hundred American newspapers. His is a fascinating and unusual story.

caulay, Longfellow Cowper and Poe contributed bul mostly to the puzzle library

Lewis Carroll, author of 40cc or II ondecland, was an Oxford professor of mathematics and the author of nancy quant and difficult pursies.

P T Barnom was an inveterate poxzler, and exhibited his faith in the lure of

6 The World-Famous "14-15" Puzzte

This passie, originated more than fifty years ago, creeted a furnce

the world over. The problem is to move the blocks through the open space bringing the 14 and 15 jato correct order as shown at the right. To work on the pustile. cut a sheet of paper into squares and namber them to correcgood with the blocks. Then move them about on a larger equare drawn on another sheet to correspond with the low

peades by using them in his circus advertising.

Thomas A. Edison has indeped pagele solving as a mental tracing, and revenlabecown knack for puzzle construction is his famous gorshours; res,

Theodore Roosevelt was a puzzle for, and encouraged his children to partiespute in puzzle contests. During White House days the young Roosevelts were regular entrants in my pazzle solving tournaments and more than occasionally flashes from the vigorous mond of the great American were discerniale in the young folks papers.

Hudson Maxim, the noted inventor, is as enthusiastic a puzzler as I know of. Once he wrote me, saying

"Men and women are but cliddren of a larger growth, and just as the k adergarten teaches the attle foliaby methods which ranke instruction interesting, so el ldren of nex larger growth are more effect yelv histmeted by methods which awaken interest and pleasure by stim nat by creative unagenation through tasking t with for solution of an interesting problem. Puzzles are post the thing for teaching mathematics.

N FACT, to print the roster of habitaal piazzle solvers who are pronuncut in other circles would require a volume comparable to a city directory. The names of distinguished elergymen, lawyers, doctors, educators, authors and publicistit are commonplace in the passle editor's correspondence The devotion of these busy people to their purale practice is intense and constant. I have many correspondents who have been following my pusales for years, and time seems only to intensify their devotion. A young larly of Boston, now in her eighties, has written nie on the auliect of paxies at least once a month for the hot twenty-five years.

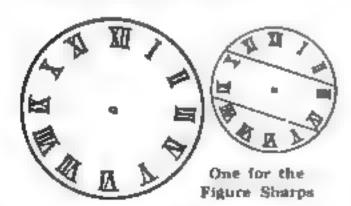
THE art of puzzle composition consuls of building a structure of ingenious claes around a akafally concealed piece of information. The first object is to pigge circposty and imagination n-brief, to tease the solver ir to trying the purse. Without this lure, the pozzle a a failure. If it is difficult, that fact must not be apparent. On its face it must be like Bret Harten Heathen Chose chimble and

blance although bke that make and volual it may be tricky and peculiar. The conditions must be clear and exact, permetting of no quibbles as to interpretation. Disappoor puzzle that relies upon twats in the meaning of words.

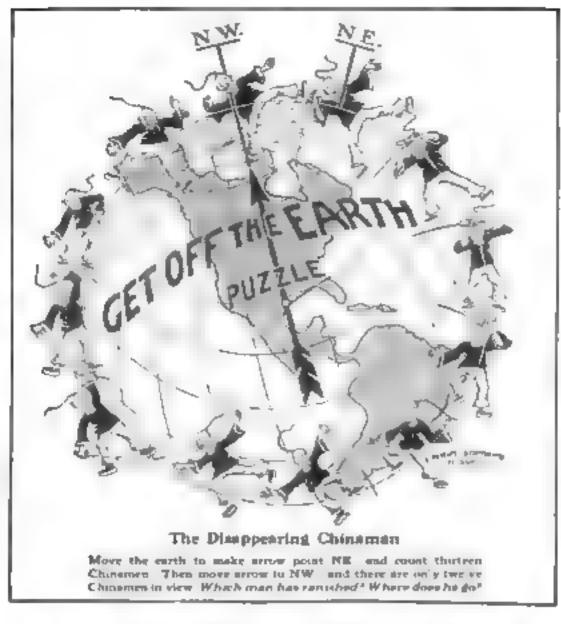
In the construction of these synthetic mysteries has the sphere of the puzzle inventor, and for some reason the public is incorrect to regard his operations as in the

realm of black art.

Replying to the oft repeated query as to how puzzlen are originated,—whether they come spontaneously or as a result of careful planning.—I would say that the best type of puzzle in usually a mosture of aspiration and science. Pazzles, like other inventions, are section made to order. They are, of course, developed and built up from ideas, but these nuclei must first be would and won.

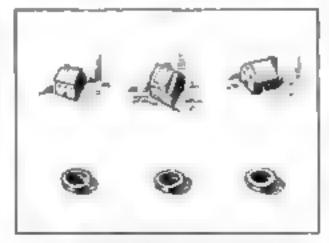


The smaller design shows how a circle distinuy be divided into three sections, each of which contains attenders adding up to 26. Now all you are required to do is cut the larger dist into FOUR pieces so that the sum of the numbers in each of the foor pieces will be the same. You'll find it a real grande



Thirty years ago, Som Loyd invented this mystifying mechanical problem. Our out the square, then cut currially around the outline of the earth through the bodies of the Chinamers. Place the two pieces on cordboard and stick a pin through the earth's center so that you can revolve it. Then follow the simple directions printed on the puzzle above, and you will be surprised at the result.

Puzzles, of course, reflect the intellectual bent of their originators. The mathematician naturally evolves his problems from the science in which be a professent while the man with a Herary bent will clothe his concerts in the peculiarities of



This is Sam Loyd's Best Puzzle

Each of the three householders was coulded to pipe water from each of the three wells, necesnuturing nine pipes in all, and they had to be laid according to the rule of the plumbers' union, which says that no pipe shall cross any other pipe. Can you show how said householder may have water piped from all three wells to either his front or rear duor and without violation of the plumbers' alwested rule?

innguage. In the latter class are anagrams, acrostics, enigmes, charactes, conundrums, raddles, rebuses, transpositions, and, of course, the puzzle family's bealthy baby boy— the cross word puzzle.

Among these also should be mentioned palindromes—words or sentences that read backward as well as forward—a very uncent form indeed if it is true that Adam

introduced himself to Eve with the words, "Madom, I'm Adam." The most famous of palmeromes at that purporting to be the great apoleon's & Languy, " Able was I ere I saw L.ba " It is well auchentreated that the 'man of destary" turned to punzles for soluce and recreatson in the days of his exile, and a number of clever puggles have been ascribed to him.

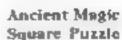
Pt ZZLES limit upon geometrical principles are great favorities, expecially those that deal with the chase for of plane figures. Most of the wooden and wire puzzles sold upon the streets and in slopes are concerned with geometry.

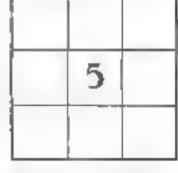
Paggles can be made out of almost any thing in the launds of one whose talents. Le in that direction. Young people take deright in paggles which enalty come bettons, match sticks, string wire, pencils and similar continuous agood repertory if nucle was the r hearts. In fact one caever track as a stock in trade and a

happy faculty for showing tolf car make the performer pass as a geness for a whole lifetime

lake thousands of others. I can trace my natiation into puzzledom through the old 14-13 block puzzle, originated more than fifty years ago, and which was puzzling the entire nation when I was a lad I stuck at that taunting box of blocks until I succeeded in goving that it could not be worked out! This statement, even at it is late date will be somewhat of a shock to many an old-timer who spent time that eventually had to be recknown in years on this intriguing mystery.







The diagram on the left shows the simplest form of Magic Square a passic design whose origin is lost in the post of aning my. Each line of numbers—across up and down and the diagonals adds up to 15. Can you reverse the proposition, rearranging the numbers in the diagram at the right leaving the 5 in the center, and produce eight different totals when you add up the figures?

Unique Radio Pen Makes Ink Copies



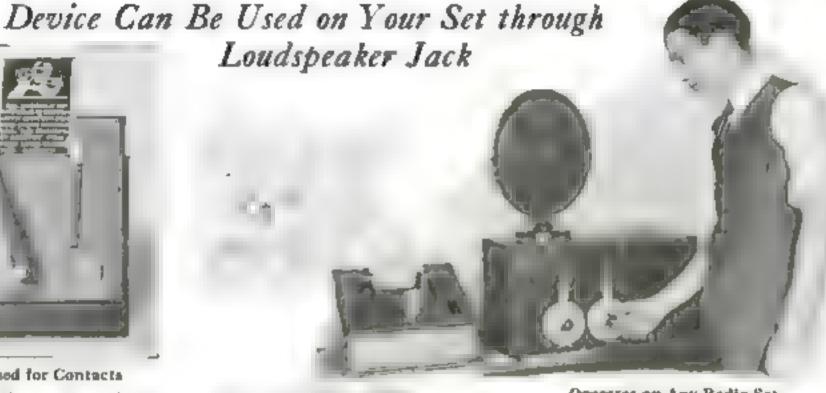
Metal Used for Contacts

The "radio pen" transmitter with the program drawing and great used for broadcasting. Metallic also or one erch-ing establishes the electrical contact.

REMARKABLE "radio A pen," which trees in ick reproduct as of cartious, maps, proded matter or script broadcust from a distant stal to has just been perfected by C. Francisc Jenkins, inventor of the Jenkins process of transmitting photographs by radio. It is said to be the only existing device capable. of training tok reproduct any on a figt surface by radas

The apparatus, surprisingly sample in Appearause is a small unchogony cubinet, about eighteen mehes animie and eight piches in he grit, and has a tilted top on which are mounted the "ratho pen" and grides for holding and moving the paper. betauth the tick strias.

The person metricarm about we nebes long, having at one end a steel split pen point of the drafting type and at the prince end a small tangage c box, researborg the ear piece of a neadsel. This ningiactic end is proposed on an axis pass, per-



Operates on Any Radio Set

Above may be seen the "radio pen receiver hooked up to a regular radio set. Just over the gover instrument, at the left, is a finished line drawing I has reproduced

> agree of levers, so that every movement of a tray from har, mounted so as to re-

> > pince the customary dupleages, is communicated to the pen, causing it to tonel the paper and make an ink mark

As radio unpolses actuate the magnets and depress the bur, the pen also is depressed, and, as it is drawn across the paper by a rathe-controlled motor, a line is produced. These

ink bines, properly placed, form the com-

pleted parture.

The radio impulses are generated to a similar-appearing machine at the broatstasting station. The difference in the transmitter is that the lines of the original drawing, either done in metallic tilk or etched on tase, form an electrical contact between the points of the bringing stylus, making and breaking at electrical erent, which is broadeast as the usual way. The drawing is slifted downward after each sweep of the styl is.



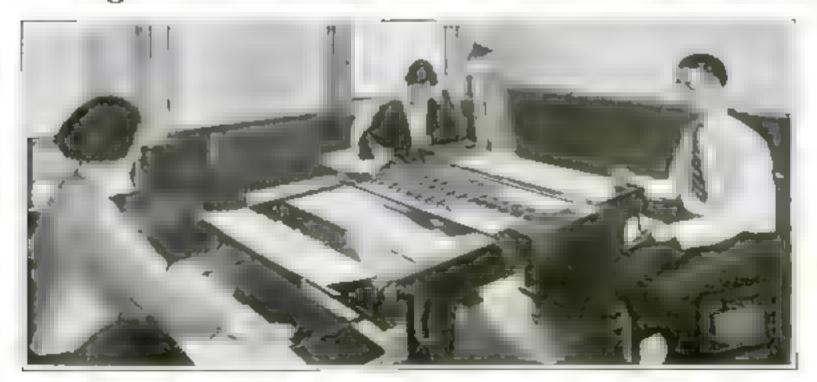
Traces Pictures in Ink.

A close-up view of the receiving apparatus of the tedeo pen" which reproduces as kinds of one drawings and print broadcast by transmitter

mitting the pen to sweep across the paper. in ares the width of the sheet

The pen, which is huged to the arm, is connected to the "ear piece" with a

Signs 11,564 Letters in Two Hours with Unusual Device



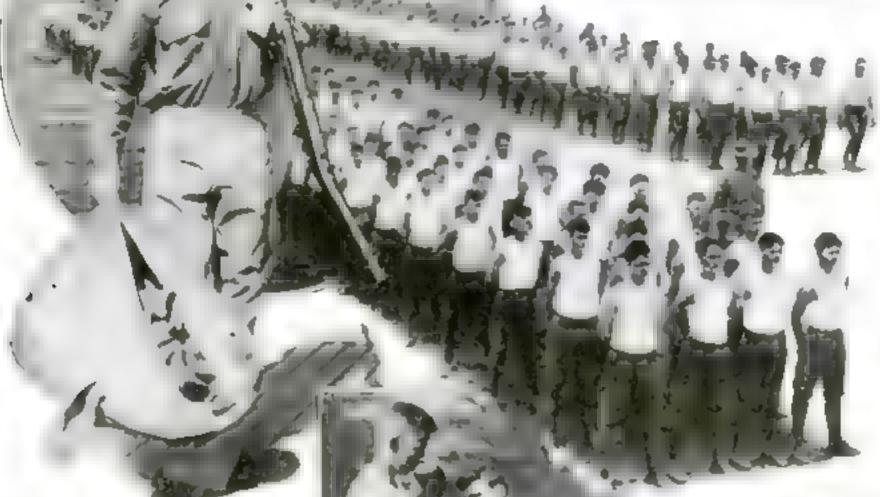
SIGNING 11,564 hours was no exhausting task for Mass Gertrude Rob ason Smith, president of a nations where s club, maked by an mgenio is device called a segmegraph

Each stroke of her pen set in ancion twenty little formtun pens, working simultaneously Two assistants noted her, one to feed letters to the machine twenty at a tune, and the other to take them off when they were aigned.

The Army and Your Boy

What the Citizens' Training
Camps Are Doing for the
Health of the Nation

By ARTHUR GRAHAME



Raw Material

Here is a typical "mobile on his first day is a riturens training camp -pale switward, uncomfortable is his ill-fitting uniform, Before his month in camp is up, he will be transformed into a smart, stalwart soldier

Don't send me home, please don't send me home!

Tall me what I sees did to you ---

Tell me what I ever did to you,—
Oh, oh, oh! have a little pity!
I'm a poor candidate,

In murch of war I coam

I'm with you in most enything you do, But please don't send me home!

So, IN plaintive chorus, sang the students attending the war-time officers' training camps one years ago this summer. Life in these camps was no restful ride on bailoon tires, as I can test by from personal experience, but it had so many compensations that one schief worry was to win marks good enough to keep from being "sent home."

Within a few months 3,5000 young Americans will be spending a month each in the citizens' military triuming camps that are direct descendants of the first Plattaburg camp, father of the war-time training camps. They will have even better cause to plead not to be "sent home" than did those hard driven men of the A. E. F who went before them.

Where He Learned to Box

John Coulidge theft), son of the President, who recently took part in the Amberst College bosing tournament, in seen here sporring with Captain Freddy Welsh, a former champion, of Cump Devens, Mass., last year

In the camps of today, the nerve racking drive of the war camps is absent Grim-faced learners of the business of war are replaced by grin-faced youths having the time of their lives, for the Army has turned from truining youth for war to training youth for peace—to instructing young Americans in the duties of citizenship, to building up their bothes by drift, exercise, and outdoor sports incidentally giving them without cost a much better vacation, and a more beneficial one, than money could buy

Adding to Their Chests

Every day the amateur addiers take cultathenic exercises in the upon a c. The result in that the average gain or each man is that teen pounds in weight one fourth shift in height and half an inch in heat measurement

These citizens inditing training camps are conducted by the Army dister the provisions of the National Defense Act of 1921. They are as President Coolinge has posted out, "essentially schools in citizenship. The basic, or first year, course consists of physical training, instruction in the different diresponsiciaties of estigensal principles and first and, dell and rifle number analyses than buff the 110 hours of matricipant are devoted to purely not tary subjects.

This summer sold error seems destrued to have an arreasing voluntificial effect on the general health of the nation. Last summer \$6,000 men between the ages of severteen and \$11 attended the energy. More than half of those who appned for admission were high school

students.

A DIRECT result of the thirty days of healthful living and careful transing was an average gain to weight of four pounds, an average increase in client measurement of between one fourth and one half inch, an average increase in

chest expansion of nearly an meh, and an average gain in height the result of corrected posture—of nearly one fourth meh. Another direct benefit was moculation against typhoid and paratyphoid, and vaccination against smallpox.

An indirect benefit that is beyond estrmate was that every graduate of the camps took home with him a working knowledge of practical hygiene and habits of healthful living. Judging the future by the past, the mettered health of the 25,000 young men who will attend this summer's camps will be well worth the \$2,800,000 that Congress has appropriated for their upkeep.

THE candidate begins to draw nealth dividence from the estaters' maintary training camps the moment he appress for admittance. Major-General M. W. Ire and, surgeon-general of the Army, told me, "In making his application, he must undergo a preliminary physical examination by alocal physician Frequently this is the first real health inventory he ever has received. Often, too, he is toto, for the first time, that he possesses remediate physical defects, almor physical defects of this remediable type are common. Half of the men examined under the Selective Service Act.

"In camp, he receives other dividends morelation against disease and a physical examination by medical disease especially trained in this work. These examinations have shown that about four per cent of the men sent to the camps have physical abnormalities that would not permit them to undergo military tearing. They also have above that forty-kair percent of the men carolled in the enimps had maner physical defects which could be remeded.

"BUT it is when he begins his actual training that he draws his biggest health dividends.

"As a rule, the youth who enters a citizens' inditary training camp is a heatby young arrival, (guorant of the means by which is physical well being may be muchts hed said improved, and heatbest of the future so far as his own health is concerned. Often he is slouchy, careless and soft muscled. Thirty days

later he goes back to civil life well set up, muscular, and with new ideas about the importance of devoting some thought and effort to maintaining his physical fitness.

"I have seen raw, untrained boys and men after thirty days in a camp parade before the President of the United States in a manner that would have been creditable to seasoned troops.

"A Medical Corps officer on duty in one of the mobile western camps last year was telling me only a few days ago of the almost magical transformation worked in some of the men and boys who passed under his eye. There was a fat boy of seventeen, for example, whom everybody in camp called Tubby." He didn't want to go to camp, but his father had insisted. Her natural physical aversion to effect, coupled with his indignation at what his father had done, made

Army Shoes Don't Pinch

Free spread and swell under the unusual use they get in camp, so shore must be fitted accentifically. At eight, a medical officer is seen measuring a recruit a foot as it spreads under the weight of the two beavy pails of sand he is seen holding. bim a poor example of a soldier for a few days. Then he suddenly awakened to the fact that one who shirked in camp became frightfully conspicuous, so he began to enter into the drills and the physical exercises with a little more spirit. Likewise he became conscious suddenly of a queer change in his physical feelings. He didn't know it, but the change was due to the unaccustomed exercise and the absence of sweets from the camp mess.



"The lat that he had been accumulating for years began to melt and his clothes became loose. Eight pounds disappeared in the first ten days. At the end of thirty days, Tubby had lost twenty four and a half pounds—and his mckname. Moreover he a going back to camp this summer

of recruits firing a machine pun at a target some 800 yards away

There was another young man, older than Tubby, who went to camp two years ago because he had nothing better to do. He was one of those good natural lazy fellows who never seem to necomplish much because they never stock at anything long. He had been ansuccessful in school: his business career had been a succession of jobs lost through incompetence. At eamp, for the first time in his life, he had to do the things that would build up his body, strengthen his muscles and make a man of him.

"Stimulated by (Continued on page 138)



Long biles through the woods are part of the soutine of every citizens' training samp. They are not taken, though, until the recruits are hardened, otherwise, blistered feet might result

A Dozen Tips on Remodeling

You can find sturdy construction in old ruins, but comfort usually is a result of your ingenuity

By JOHN R. McMAHON



Made a Century Younger

This charming Dutch colonial dwelling at Cedar Grove, N J., was remodeled from the 100-year-old cottage to the picture below

I P YOU want a home quickly and at moderate cost, you don't have to hind a new house. Buy an old place, move in, and tinker and doctor it up wher and as you please. A barn will make a dwelling, even a stable is not to be specied at. Frequently the worse the rion the more chance for a elever job, and the greater the credit for the transformation.

Itemodeling old houses in popular in America. Formerly folks were somewhat apologetic about accond-hand, unkered demeiles. Today, thanks to the example of our "best people"—the artistic as well as the moneyed—it is good form to live in an old building. An abandoned church, a lighthouse and a chicken coop have been converted into homes without bringing social stigma.

In the East, coloral runs are favored An architect is lived—but not to raise the low coining or to mustiply the scandy condows or to throw several cubicy-holes into a few spacious rooms. He dare not descrate the makesingth of our pioneer sizes with obvious modernity. His task is to keep everything seemingly two cen-

turies old, while he contains high hides the essential improvements in plumbing, heat and light. The grand old fireplace yet pretends to be useful but there is steam heat in concealed radiations. Candles are aligned but the domination comes from masked electric lamos.

Such a house is only excusable as a historical relic. Eke Ford's Wayside Ion. Our ancestors themselves would laugh at us for squeezing ourselves into their primitive dwellings. It is indeed desirable to keep the general lines of an

When You Remodel:

- Make a cellar, if there isn't one, by lifting house or digging under
- 2. Point up or face foundations to with ruch coment. Additions to walls can be built down as well
- 3. Replace decayed sills and beams. Inspect all timbers subsect to mountain
- 4. Rebuild old chimney and put in flue lining
- 5. Leave old shingles on roof, unless too curled. Cover with new material
- 6. Let outside wall covering stay beneath new siding shingles or three.
- If there are no outside shouthing boards put them inside.
- b. Equalize their levels get red of a "step up or down."
- 9. Put new Houring over ald.
- Inft low certings.
 Increase light and air with more or larger windows.
- Make larger commutant cubbyholm by changing partitions.



The New Covers the Old

W Proces 60 year old muses plantering a web in the house above above. Note the original marries for supporting masterines and the water study with the back still on

old immos, but it is for is a to sacrifice count at and smothal or for an hearboun-effect.

Here are arguments on not sides for remode agrees a kolding. You have to put up with what you had not new ready hult house as well as in an old house and many become closed sfield with a made to-order dwelling. Age is not proportant; the real factors are material, construction and the state of preservation. The present high east of building in

perhaps the best argument for the old house, reasonably bought. Remodering should not be as expensive as at new work and it reed not be done all no one time.

Other things being ental of two dwellings twenty five and too regres on I would be included to choose the latter. The more recent house is aftern from each that is, built of light timbers. The ancient specimen is of heavy construction. The wesdwork is often oak, walnut and white pine. On the other hand, the older house generally needs more interior re-



What skill and ingentity can accomplish was exemplified strikingly in the transformation of this ancient cottage into the modern bome at the top of the page

Old Houses





The Good and the Bad in the Homes of Other Days

Of hometane one of a prome a combine manuscriptor to the extraction of the straight of the str

modeling than the more recent dwelling. Much of the advice given in a previous article of this series on sixing up a new house applies to an old structure. Examine everything from cedar to roof. Figure out how much remodeling you want, and add the probable cost of changes to the price asked for the dwelling. You can get an estimate from a carpenter on the expense of remodeling and then do as much of the work yourself as massive.

The lack of a cellar is usually the first problem that confronts the buyer of an oil house. There are several ways to remerly that. You can dig out the earth under the structure move it to a cellared site, or mose it to provide a busement. The last is done often to give the hying

floor the benefit of dryness. Light and view. It may be the only solution where the site is rocky and cannot be exervated.

IT IS best to have ruising done by akaled, workmen. They know how and have the needed powerful mcks, massive beaus and proptimbers. They can clevate a house. elinu ey and a l. without cracking the plaster to any extent or doing place damage. Usuaby the house is lifted a few menes above the desired height and afterward lowered to rest on the new cellar or basement walls. Such walls generally are built of solid concrete or of concrete backs. Except for the footnga, an eight iach wall is eaongh, according to government experts, though local building codes may require ten or twelve unches. On firm soil the concrete footings may be eighteen inches wide and a foot deep.

Lately I saw a bungalow raised and provided with a complete basement. Kitchen and bathroom were placed downstars, and a dambwa ter carried food to the dining room above. A new foundation was built under the elevated

base of the old clumney. An extra tilelined flue was added to the chumney, supported rather ingeniously by a well reinforced concrete shelf

It is a long established belief that walls must be built from the bottom upward. This is a fallacy, according to a neighbor of mine. He bought a celluries house whose foundation walls extended about three feet in the ground, and since these were of good concrete be did not want to demobsh them in making a cellur. As an engineer, familiar with turned work, be was not long in develop a method.

He excurated enough to place woosen props every four feet under the old four-lations. Then be dug away the rest of the earth, made forms continuing the old foundations to the level of the cellar floor, and filled them with concrete. The wooden proper were left imbedded in the concrete, where they are as unpershalse as the nucleon, that surrounds them.

OLD cellar walls, laid or lone mortar and even neer clay can be restored by "poir ting up" the chinks with a rich in stare of Portland coment and sand. It is better yet to plaster the whole surface with about two and one half parts sand to one of cement. Where the wall is very inteven, has large chicks, and the site is wel, it is a good scheme to build a vertical form about four inches from the wall and fill with sloppy concrete or grout. Use only small gravel or crished stone in the mor and rain well in place.

This is it fill every crevice and make a smooth, hare, water-tight surface,

The ancient chimney, without flue hang, is a fire menace and is best torn down. Doctoring it with cement outside is not much use, Everyone should know that flue limng, made of special fire-resistant clay, is the only safe material.

The decayed sill, the first and lowest house beam, often resting an a damp fuundation wall, may have to be replaced. So too the first floor beams that are exposed to the moisture of the cellar or of the unexcavated ground. Dog in with a peckerie and the apparently solid woost shows itself plank. Perhaus. the decay is superficial and will i=1continue with suproved conditions of dryness and ventilation. We might replace the worst joists and put a new girder under all, with iron column supports. It would be well to serutanise the old wooden posts.

The mystery of why one beam rots quicker than its immediate neighbor was revealed to me recently when I looked over a house of the vintage of the 1880's. The pioneer builder had obtained his lamber from the trees standing around the site and had not been





How as ordinary fermiouse at Watermill, N.Y., was remodeled at lavic expense into a stately colonial home. The tabler porch pillars switted a mage change in appearance



The possibilities of the typical old New England house at the left above with its ugly porch that derbens the sooms of the lower floor were egalised when it was remodeled into the comfortable borne at the right.

Removing the porch and adding a wing made the house graceful, bright and receny. If you are lucky enough to find a house of fundamentally sound structure, such remodeling is usually worth-while

particular in his selection. He out down an oak, next a tulip tree, then hickory, hemlock and sycamore whatever was handiest. Enough bark was left on the hand hown timbers to help identify them. Naturally the perishable whitewood or tulip could not stand collar mounture as oak does, and some chestnut jouts endared much better than hickory.

The more recent dwelling in generally balk of uniform material, but this fact should be verified, and uniformity may not mell the best choose of lumber. You are in luck when you find first floor beams of oak, chestnut, sprion, long leaf yellow pine or the like

WHAT shall we do about the old, leaky slungle roof? It used to be the practice to rip off the old material and shingle new. We now see the advantage in heat and cold insolution, as well as in labor saving, by leaving the first covering on-provided it is not too warped or pregular in surface—and adding a new top. There are many kinds of roofing to choose from, between asphait, assestes and copper-

Distring the top is no mere theory The out time shragle mof is an 3 a slight protection against the elements, nothing being under the shingles except mading atrips across the rafters. No worster icy air flows through the attic in winter and chil's the towar

The better sort of roof as built now con-

souts of three layers mintched abenthing boards, next felt and then the final coveeing. The uniterwriters tell as that wood shingles are always a fire hazard. If you must have them, select the best mughery exten thick and hand split.

Let the old wall covering of your house stay in place and cover with new aiding, abungles or stacco. The usual object of adding a new outer surface is to make up for lack of sheathing and to improve the appearance of the house.

The other day I saw an arteresting job of this kind done on a barn converted into a dwelling. A previous occupant had begun to remodel the barn, applying siding direct to wall stude. The present owner decided to add stucco to the lower balf and shingles to the upper part of the exterior. For the stucro job he mailed lath vertically a foot apart to the miling

Have You a Building Problem ?

THIS is the third of a series of articles on home building by an authority of national reputation. To make this series still more helpful, Mr. McUnhon places his experience at the disposal of readers interested in home building. If you have a problem, perhaps he can help you. Address John R. M. Mahon, CHEW POPULAR SCIENCE MONTHLY, 250 Fourth Ace. New York, enclosing stamped, telfoddtessed envelope

Then he stapled to the lath galvac zed were needs of one third inch spaces, and to this he applied the stucro.

If there is no sheathing on the outside of a house, it is a good scheme to put it monde, if the interior is not lath and

plaster, as in the half fluished dwelling or summer cottage or extensions. Either put the sheathing directly on the study or over fiber board. This strengthens the wall and also makes it warm and dry The inner sheathing may be covered with fiber board or it may be "furred out" and covered with plaster board, wall board or regular lath and plaster to the latter case a montureproof buildalg paper should be tacked under the farring strips. Usually common North Carobia piae boards, shiplap style, eight as her wide, serve for sheathing.

THE walls of a frame bouse normally consist of four layers of material on the study or uprights—the outer covering, banking paper, sheatlang and finally some sort of interior surfacing.

An amater r remodeler I know thought he could improve on this combination, and built six-layer walls. The added elements were mode sheatling and bementh at on the study, an extra layer of aspliant reoling materal of bunding paper I to on certage be used twice the usual number of parters, s, that is, first should rig then asphalt roofing next " subrg" of their materied loanes, finally bher board. Such a house would withstand the rigors of an arctic character and in a mild region takes very little coal to heat up writer and a always mod in number. I noteworthy feature is the use of inner sheathing to give a rigid back to fiber

> board, which in a rather weak and warpable surface as ordinarily applied to studs or jourts. Wath the method, fiber board stays flat and is as sold as its LEALANCE.

If the old house has different floor levels, a step up to the parlor or one down to the kitchen, the levels may be equalized by laying on the old flooring siecpers or joists, on which new floor is mailed Lowering the original joists and replacing them on the foundation (Continued on page 135)



Country dilar Pertiand Crown Co.

Remaking an Old House with the Aid of Cement

These two views of a New Hampshire dwelling, before and after remodeling, illustrate the amounting change in appearance that can be arought by making a few alight structural changes and finishing the exterior with cement. The methods are applicable also to smaller structures

Only the Daring Work for Him



If YOU have witnessed a circus performance in the last four years, you may have seen the Flying Wards swinging, diving, and presenting in the air beneath the name of the billowing big top, while the circus bar a played a bit ng walts and the tiwners on the bits sents gasped and applicated. If you have seen these young man and women gloring gracefully from perch to trapeze bar to enterer a bands and back to perchaptant on doonchalar thy taking the chances on broken bones, you have witnessed the "dying return act," feature of the ing show

Eight of the Flying Wards are "working in a steel rigging suspended over one ring. Eight other Flying Wards are "working in a sentar rigging, suspended over another ring. For twelve minutes they have 'stopped the show, they have had the tent to themselves.

Finally, as they dive into the net

stretched beneath each raging, awing from the net to the ground, "line up" and "take their how, you may notice a heavy-set bland young man with deep chest, thick arms, and broad shoulders gamee with approval at the new of trun-built gyntrasts in white tights who are sharing the mand ts. That's Eddie Ward, chief of the Flying Wards.

Jaidhe Ward has been a circus acralist for twenty seven of his thirty eight years. He has "broken" more than fifty boys and girls into his exalted branch of the circus profession. He has more than thirty "fliers" and "catchers" on his payroll. He is one of the master minds in the world of sawdust and spangles. He has earned, saved, and invested his more until he is worth \$150,000. He has made his own way since he was seven years old. And he started on a bomemade backyard trapeze!

"You see," mays Eddie, "I had to begin supporting my mother and softer when I was seven. I got a job in a ment market and sold newspapers on the side. But I was a healthy kid. Mother's uncle had been a circus performer at Europe. There was a thorn apple tree in our backyard at Bloomington Hi man. My mater was two years vounger than I, but husky, too. We rigged up a trapeze on the thorn apple tree and renearsed an act

"We got our first professional job when I was eleven years old. It was at the Atlanta, Ill., ons, county fair. Our salary for the week's engagement was fifteen dollars. To increase our income we passed the hat. We took in four hundred and fifty dollars that week. When I turned that fortune over to mother, she told me to quit the meat market and paper route and go into the circus business, I have never passed the hat since then,



The most dangerous and speciaestor of an aerial tricks the triple back someone I from trippess to entoher to so we also so The He whose path is at own in the latter are or a long tool during the third revolutions, but not during the third

har the form Wards are the result harder Ward to one of the greatest to the analysis and realing to topped on the public participation of the

till som ge stalore sidenmat stors

"I ve taken a good many fads in my time," he says. Sister and I took a lot of them doing our old double-trapene act. There isn't say net under a doubletrapene act. When any one lets go, the only thing to hit is the ground.

"I got to studying these falls, generally from a hospital cot, and made up my mind there was no future in the straight trapese business. The salary was limited, the act was old. Flying return acts were just coming on. I owned ten acres and a bouse and barn on the edge of Bloomington. I rebuilt the harn and started studying falls into a net. When I tearned that there isn't much to falling into a net when you light on your back or shoulders, I framed my first flying return act.

The accreta of success in the flying return act, Eddie naively explains, are important though few. All that is required of the fliers or leapers who do single, double, and triple somersaults from trapeze bar to the catcher's hands is perfect muscular control, perfect judgment of time and distance, and the ability to figure on gravity. The requirements for the catchers—and Eddie is one of the catchers—are much the same.

ABOUT the only apparent difference helween firers and catchers is in weight and agility. The filers must be aerial contortionists who know no fear But the catchers do the timing. They say "Go" to the fliers. Each catcher, hanging head downward from a swinging trapese, tells a flier when to leave the perch and when to east loose from the trapese bar and fly toward the catcher's outstretched hands.

If a fiber, after whirling over and over through the air, is just able to touch his catcher's fingers, that flier is out of lock Gravity gets him. He keeps on flying and falling until he hits the net—or the ground. That's where Faldie's fine work coines in. He starts his boys and girls right, when they join his kindergarten class.

Even the stars of the flying return act, who are the stars of the gymnastic world, began professional life as "carpet acrobata," learning back benda, handstands, handsprings, and round-offs. The last are handsprings started facing backward and ended facing forward. They learn backward somersaults on the ground, with a safety belt or "mechanic" strapped around the want and held by two oldtimers. Then they are taken into the rigging and learn to fall into the net and to do flying tricks and fancy dives, still with the protecting belt attached to a block and tackle, keeping them from breaking arms, legs, or necks.

Estine Ward, student of gravity since he reased to be a butcher's boy was one of the first, among teachers of circus fliers to rehearse acrial study with a infety belt around each flier.

"When I learned the business," he told me, "filers took long chances when they tried aerial stuff. If they were diving or falling into the net, they might not strike face forward and break their neck, and again they might. If they taissed a catcher's hands, they might land in the net on their shoulders and get only a few welts from the ropes, or they might bit it before they had completed a turn, and so break a leg or worse. I don't care who it is, if he gets all jammed up while trying to master a trick his nerve isn't so good after that.

The stim up to rig catcher awarging and to the win to a distillent country had when he the a land we have he did the flor must hap has we stated as a great to a Killer West mented as a secret with a secret to a land to a land

"When I take the safety belt off my flore haven't any fear. They know there was I this do not a cool to anally are elever enough to land right in less fork is against the

The catcher is the flier's only insurance, for the flier is regarded as a poor risk by casualty companies. As the catcher swings backward and forward on his trapeas, forty feet from the flier's perch, he must know, although he is upside down, when to say "Go" to the flier. He must calculate to a necety just when and where the flier's revolving body will meet his for the flier's hands must clasp his wrists while the flier is going forty miles an hour.

THERE are many varying conditions to be considered. It may be a bitter cold spring day with snow on the big top. That slows up the gymnast. It may be a terrifically hot day with a temperature of 135 degrees in the dome of the tent. That means perspiration and slippery bands and wrists, in spite of extra resuming and wrist wrapping. Eache lost the best fier he ever trained because perspirat on interfered with a perfect performance, and because the fier was attempting the most desired and dangerous of all fiers' tracks—the triple back somerscult from trapeze to catcher

The flier was Ernest Lane, who had done the "triple back" in circus tents and on fair grounds a hundred times. He had everything to make a filer—splendid control, perfect nerve, ideal weight, extreme aguity. But while rehearing for the spring opening at Chicago in 1920, Ernest let go the trapeze a attle before he intended to-slipped off in fact. A ther. can control his body during the first and second revolutions, but not during the third. Lane's groping hands, as he flew along, mused Eddie's outstretched hands. Eddie, resorting to an old trick of the (Continued on page 133) trade, struck at

Hungry Moths Cost Us Millions

How to Save Your Clothes from Wool-Eating Pests



Cohies trothe above and larve of the a school The work in the hosting to only the gurdenn to the better, which in No-income diameter, gives an alon of their cure

By G. B. SEYBOLD

"GOOD I is mucher winter," you comment with sat sfar hou as you pack away your

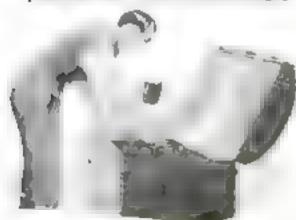
In terms | In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computation |
In the computati

note the observations of our single female moth one destroy 190 posteds of wood a year estimated to the wood produced by thetern sheep. And damaged one by moths as the Linust States is as marted at the amazing som of \$200,000,000

And it is not on wool alone that the moths feed. A fur color is a nice morsel



Before putting liother away hang themes puned to the our and best them thoroughly



Moth balls or dakes packed with carbes in a tight container will hill all the pears



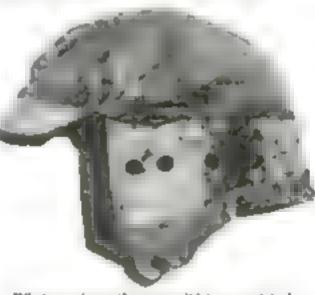
1 Be fore justing clothes away for the more mer, inspect thoroughly for moth eggs.

Hong the clothes in the hot sandwise for the control of press them with a hot.

tron; or took them in boiling water
3. Keep the lid of your color chest thin
4. Hang clother where it is light. Heach
and share them treas a month
by prosche was not take containers such
as paper lags seated pasteboard basis.

o pepet tetapone for storing for k letters with most builts or flakes fortiget mathematisted closette atteration should be brushed beaton, and vised thoroughts every two or three not starting the sommer

tehen's at 15thes gree old ger them unus. They are fine homes for maths 10. Every time you see a moth small it

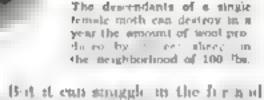


What greedy snoth worms did to an evistor's far belinet. Not astrafied with entarg away all the far they devoured part of the leather section, too. Note the moth occurs above the visor

Hair and feathers are special favorites. To outwit your enemy, the clothes moth, you must be on the alert constantly Now, while storing your clothes, you can fight less!

The nullers fitting about your light are not the guilty ones. They feed on vegetation, and will not touch your clothes. But look further, and in the darkened corners of the room you will find the clothes moth, a small yellowish or buff colored creature that measures only half an inch from up to up when its wings are spread

In itself it is harmless. It wou't bother your for cost, because it can't est. Its mouth is imperfect so that it cannot chew,

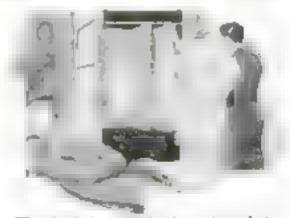


trace I twitten to the new of the form the series I twitten to the warm series and the warm series are return worths. But will a repulsive lastelies from the egg, the beginn nating your clothesis.

Before you put away your clothest for the summer, aspect them mainte-

ly for concealed moth eggs. The tray whote eggs, smaller than a pinhead, crust easily. A thorough beating of your real will destroy them. Turn the pockets made out and inspect the seams,

Heat I kewise, will do the work. Hang all your elothen (Continued on page 134)



The simplest procesution is to store clothing in sir-tight paper bugs, tightly scaled



JOHN K. MARTIN

E. A. Lebaianu, the German authority on arrylan operation and first officer of the Low Angeles on its lustone trans-Atlantic

Working side by side with a score of Universian cogineers and designers, these successes of Count Zeppelm, I found, are contributing their expert knowledge gained through long experience in dirgible construction and operation. And adtasericana and Germana aake—are mteneds and on fashioning the super- i i i to be not only the greatest but the safest ever devised, and to be

TOR to they metend to strip there. A sigh the GZ-1 far overshanows a y previous airship project, it is no searet that these experts already are considering plant for other think even larger. And before many years, if these

in ad merchantmen transporting

to be expression in Litel field.

ery port in the world r at Aicron is certain it can be

Americans Plan the World's



EAR the vallage of Ava, O , lay a storm-shattered mass of wreckage the ghastly corpse of what had been the world's finest dirigoble auslap. Torn snander in the grip of the winds, the \$3,000,000 Shenandook had created to earth, carrying fourteen officers and men to death.

In the wreckage, it seemed, lay the dreams of those of us who had placed in this proud ship our faith is the future of dirigible travel. For in the term and broken bulk we saw but another repetition of the disasters that had befallen the greatest of the Shenandoob's predecessors. We recalled how the ZR-2, on its treal flight near London in 1021, crampled and burst into flames, kiding all but six of the British-American crew of sixty-ax; how the Ituban-built Roma exploded above Hampton Roads the next year, killing Durty-four, how the great French dirigible, Durmude, vanished somewhere over the Mediterranean in 1923 with fifty souls altoard.

We remembered, too, the almost maneplans escape of the Shenandoak on that wild January night in 1924 when the gale tore her from her mooring must at Lakehurst, N. J., and the equally dramatic runsway of the British R-33 which battled a terrific storm in the North Sea for thirty bours.

A record of tragedy and near-tragedy to discourage even the most optimistic behevers in lighter-than-air craft! Yet in the face of it we are told now that in Akron, O., binlders are preparing to lavthe keel for the greatest airship the world

has ever known a manmoth of the skies nearly three times as large as the Shenandonk'

How can such a ship be practical or even possible. How can its designers prevent another disaster even more terrible than those that have gone before?

For an answer to Diese questions I went. to Akron and there I found a little group of German experts at work under the shrection of P. W. Litchheld one of Ameri-

east foremost air ship outliorities. making of this Ohto manufacture ing city the Friedrichshafen of America. There I found Dr. Hugo-Eckener, former head of the famous German Zeppelm plant at Friedrichshafen and communder of the Los Angeles (ZRwhen she was delivered across the occur to I note Sam. There, too, in Dr. Karl Arnstem, once chief engineer of the German plant, builder of the Lor Angeles and nearly 100 other Zeppeline And with them Captain plans curry through, we may see whole

1,50

h we a the GAL

done. And their confidence, as I soon dis-

binself, an almost boyosh-looking man, whose vigorous frame and clear, searching ever radicte healthy energy, fremenda is er the siasm, or a randorou raged optimism. As general turnager of the new An erican Zeppelar plant, he is the forestid personacity which is projecting the superare up, and which preposes to make America lend the worm in developing lighter than a r craft for commerce. He

"It is one roly possible." Le to I me, "to baild dir g bles of the Zeppear type



Preparing the gold bester skins for the gas cells of a Zeppelin in the Seppelin factory at Akron, O. Varnish is applied to the skins to stallen them and make them more gas-tight. Observe the size of these

Largest Airship

The New Dirigible Is to Be Three Times Size of Shenandoah

many times larger than any yet produced, and it is possible to build them so that they will be absolutely safe. Engineers know that the larger an airship is, the greater is its efficiency in lifting power and cruising range. It is because of this that we have designed the new wonder of the air to eclipse even the two gigantic Brit shadajus whose keels will be laid this

"THE GZ-1 will be solely a conductl ma) ship. It will be able to made the globe in any direction. Although it will be nearly three times as large as any previous airshap, it will be easier to navigate. As for its safety, our engineering staff, which it cludes some of the works s leading authorities on the subject, have worked out the details so thoroughly as to exclude every possibility of a serious accident that might destroy it. In fact, we are so convinced of this that we would give a gold bond as assurance of its aufety

"Here is what the new slop will be like he adoed, spreading on a table a number of plans and drawings.

If you were fortunate enough to have seen the Sheanadoub before her fatal crash abinvacing majestically overlead, perhaps you may garr, by comparison, some man of the tremendors proportions of the GZ-1. Imagine these two shaps sashing side by side, rudder to rudder.



The Zeppelin of America

P W Litchfield one of America's foremost nicehip nuthorities, planning to build a direeible three times so large or the Shonandonh. Aumhupa can be obsolutely safe " he says

The nose of the 800-foot GZ-1 would extend beyond the other the length of a city block. If both ships were resting on the ground, the top of the Skenandouk would reach only halfway up the side of the GZ-1, which will be 130 feet high. If placed on end, the GZ-1 would over shadow the world's tallest sky-scraper

This new aerial grant will hold 7 000, 000 cubic feet of belians, compared with the Shengadouh's 2,148,000. It will carry enough fuel for a non-stop crune of 0,000

unles. It will be driven at a nuxtmum speed of more than 100 unles un bour, or eighty-five nules an bottly against a strong head wind, by eight motors developing 4.800 bursepower more than three times the power of the Shenandoah and sufficient, the designers say, to huck through the ficreest storm or to make a safe landing in the severest weather.

In shape and general appear ance, the GZ-1 will resemble the American dirigible Los Angeles and the two 5,000,000 The Smallest Blimp

The Pilgrim, P. W. Litchfield's private sirship, in only \$10 feet long. It curries two presengers and is used mainly for research

cubic foot ships which the British government in constructing, except that it will be somewhat slenderer in lines. This feature, it is believed will make it casier to bandle, for the ship will present less surface to a head wind.

"But why." I asked Mr. Latchfield, "are you so sure that this magnificent ship will be any safer than preceding ones, or less likely to end in entastrophe?"

"Ill let Dr. Arnstein answer that," he

replace

This German technician is the chief engineer of the Akron Zeppelin plant, exactly the same position he held at Fredrichshafen. He has every detail of design and construction at his finger tips, and be speaks to the point.

"FIRST of all," and Dr. Arnstein, replying to my query, "we will use a new and suproved domination inetal which will give greater rigality and strength to the superstructure of the stop. And, in the second place, the structural design of the GZ-1 will be racically different from that of may other yet built. Mong the bettom, two correlors of lattice work construction will run the entire length of the ship. Into these threschinger was bebunt the circular cibs, also of latticed construction, which will support the envelope. Between the ribs will be interwoven steel wire bracing, forming a network of fine wires which will add to the ship s rigid ty and hold the rips in piace.

"An advantage of this corrulor arrangement will be that it will make the interior of the bug acressible from almost any pent. Thus I are thoug should go wrong or any break should occur while the ship was in flight, it could be remedied instantly prevent ug the possible development of a sectors weakness in the structure."

But probably the greatest factor for safety, he pointed out, lies in the fact that the control cabs all will be built as integral parts of the superstructure, making it impossible for one of them to tear loose from the ship and cause disaster, as happened in the wreck of the Shenandoah.

"Engineers now are able to figure (Continued on page 128, stresses so



large and the care used in this process to prevent injury to them. The Yaznish a put on and spread with big soft wads, and the girls working. on the job wear soft pedded shoes so as not to stretch or teer the febric



Where Movies Get Their "Props"

One Secret of the Films' Realism

All the "proper or not proper property of a result of an account of a country of a a least on the property of the second of the gone every conservators approximately be reading to the servation of the s that I givery land and come made were by prediction we trappears from while the ends of successful to place the supplementary of the supplementary o according to the contract of the section of the sec

The section of the section of the top and by many a control of the great control of particular to the same







An enternation of silk of bottless. with following there or can to ar at pre V datead coys a kept onstant tepleti and t They are over all eaper ally for be room a cream in the fame paturn. The attended seen of the above policie just ing our some popular brands a one of The businest parkets in his Compressive establishment

The graphime & sixo regresection 1 (t) the git of She ware frequently collector. n mecanina and phost at men and various lypes are in at a kill

Every proposition be exact in the right shows on expect at work visitely inspecting helmet places for a new porture

Odd Bits from the Records

Nitrates from Air, and Other Discoveries



Tutunkhamen's Coffin, World's Finest Work of Ancient Art

HERE are two views of the magnificent gold coffin which actually contained the mummy of the Egyptian boy-ling, Tutankhamen. Above, Howard Carter, discoverer of the tomb of the Pharaoh, is seen removing the ceremonial oils which had formed into a gummy, pitchhis substance. At the left is the coffin in all its pristine splendor after having been thoroughly cleaneed. This splendid work of the ancient goldsmiths' art was the innermost of three human-shaped coffins which fitted tightly into one another. It is more than six feet in length and is beaten out of about \$250,000 worth of the finest gold bullion. It is wonderfully engraved, its filleted surface of intricate designs is inlaid with turquoise, lapis lazuli, and earnelsan. Observe the neatness of design, the perfection of form that reveal the highly developed art of the ancient golden that The coffin represents the youthful king in the form of Ouris, judge of the dead, holding in his hands the whip and the crook, his body protected by the vulture deities, and his legs by the wings of the Egyptian patron goddesses. It has aroused the admication of artists as well as the interest of scientists the world over

POPULAR SCIENCE MONTHLY presents on these pages a symposium of some of the most recent ideas and achievements of scientists that bear especially. on aus everyday lives

Our World Fifty Years Hence

TE ALL like to speculate about the world of the fature how we will be living fifty years from now, and how our children will ave after

If population keeps on mereasing in the United States as it has corressed in the last lifty years, there wal be at the beginning of the next centary 355 in then people here according to Professor Howard B Wooklon of the Inversity of Washington When this condition exists, people may have to be content with tabloid flats like those being built in Young. With built-in, disappearing furnit ire, one piece of which vanishes as another comes into view, a young architect there has just succeeded in putting witnin forty square yards a hall, a kitchen, a sitting room, and veranda.

A Canadian expert in city planning. Nottlan Cauchon, gives us his idea of the city of the future. He sees city blocks of those days six somered assterd of square. Hexagonal blocks, he says, will mean more light and air, and the signag streets will reduce automobile accidents.

An ingenious idea for heating the houses of the future by radio has been advanced recently by Professor S. E. Dibble of the Carnegie Institute of Technology, Pittsburgh, Pa. He hopes to transmit heat by waves just as sound is sent now. The time may come in our own lifetime, be feels, when heat for an entire erty or even a whole state will be broadeast from one great central plant

Chitdoor recreation chilinsiasis are advocating that the government plant big forests encurcing our great cities. These would provide wood, and also playgrounds for people of the cities

New Tank Car for Helium Gas

THE United States Bureau of Explo-A sives has recently approved a new type of tank for use on milroads in transferring belium gas, one of the most valuable substances in the world, from one base to another. The new tank has a distinetive cylindrical shape, painted black,

The contents of ten of the care would be enough, it is said, to fill a dirigible the size of the ill-fated Shenandoak. Should we ever have another war, these hehum trains would become a common sight. They need careful guarding, for the gas exerts an extremely high pressure and a neavy shock or jar would cause a terrific explosion.

Chemista Solve War Mystery

TRING the war, the United States seized a German patent on a method of extracting nitrogen from the air The Muscle Shoals plant was broll to make use of it on a buge scale. N trogen and hydrogen passing over hotorist prepared in a certain way, the formula and wome give ammoria.

But the process usin t work. Something had been left out of the formen by the German chemists, purposely The are part of ammount desired was too amal) to be worth while.

American chemists werk to work to deserver the missing factor. Now, after years of parestaking research, the Pa mer Laboras tory of Profection () versity armonnees Dust if appli amounts of a and re cames, and as sodium, potasatam,

and calcium, are added to the iron, the yield of ammonia is facreased chough to make the process commercially valuable.



Glass That Can Be Bent

A glass that bends and bounces without breaking is a new Austrian invention. The photo, showing a slender rad being bent. gives an idea of the flexibility of this glass

of Science



Tired Metal Detected by N Ray to Prevent Accidents

The gue of metals a the size of the matrix of set one to a transverse vest. The entral becomes detailed fixed on the size of set on which is a result of the size of the size

Calculator Forecasts Success

This machine, called a "success calculator," does involved mathematical calculations both quickly end accurately. It was invented by fluors C. Dodd, of Princeton University. Dr. Howard McClenahan of Franklin Institute. Philadelphia, shown inspecting it.

It is a discovery important to every entreen of the United States. It not only will make its independent of the intrate fields of South America in manufacturing account in time of war, but will lower the cost of foodstaffs. If intrates can be

obtained from the at on a large sease the farmer will be able to obtain fertil zer at much lawer prices than at present.

Leaded Gasoline Safe

TETRAFIHAL lended antike-rek fael may now be used
with perfect safety in your antimobile. Consternal on created
a few months ago, when reports
of its possenous effects caused
it to be withdrawn from the market, is altayed by a report of a
special committee of the United
States. Public Health because
which has been my estigating the
component and its consequences.

Two burness and fifty two men were examined, most of them car owners and asers and garage employees in Dayton O., some of them handing gasoline treated with the lead, and some of them intreated gasoline. The conclusions reached were that the anti-knock compound itself is dangerous in concentrated form and must be handled with great caution, but the treated gasoline is safe to handle and use as fuel.

When the lead compound is again put on the market, it will be labeled "motor fuel" instead of gasoline. Clearly distinguished in this way, you will use it only for fuel and not buy the lead-treated gasoline for cleaning, in which case you might run a risk of poisoning by absorbing lead through the skin

Anti-knock fuel is the result of years of labor of American engineers and chemists. It is good to know that this maproved fuel can be used without rejury



To Study Goriffas in Africa

Mr and Mrs. Carl Aloriey noted explorers, photographed just before they sailed on their latest expedition to Africa to spend cleven months in the study of human characteristics of gordlas

Total Eclipse Here in 1932

IF YOU musted seeing the last total reclipse of the san in only six years you may have another chance. Last year is January, when the san a darkening was witnessed by nullions of people in the limited States, we were told that the part of totality would not fall across our country again for a century. Now, new category takes show that an eclipse in 1852 is 1 loss Canada from the northwest and

go down through the New Engisid states, passing out to the Atlantic through Massachusetts.

Observations made by the expections to Sumatra reserrity, on the total solar eclipse, or the whole were reported satisfactors. Good photographs were obtained, but it will take more that of study before definite results can be not expected. The corous, the astronomers report, was the regular regular regulations were said to be visible.

Why Chicks Can Walk

IT TAKES a baby months to learn to wask. But watch a checker! The tent stends about, nameging its legs without the least effort.

This does not mean that newborn chickens are more intelligent than new-born babies. It merely indicates that balancing and standing are automatic in the chicken and not in the baby. The latter has to use its brain to control its legs. Recent experiments at the University of Chicago show that the chicken's balancing is governed by reflex action, needing no brain at all,

Yale Professor Clothes Ancient Fossils with Life Forms

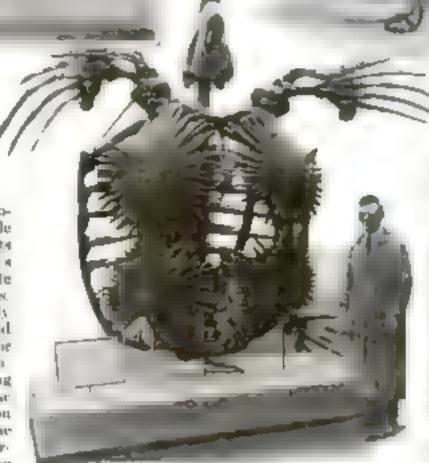
Strange Animals of the Past "dire wolf" of the Stone Age recunstructed by a remarkable new process, in abusen or left an it probably looked when slive exright, in the skeleton form



ECONSTRUCTED akelctous of discours and other prehistoric ampuda in museums give un aweinspiring idea of size, but little else. A new and ingenious method of mounting such skeletons, devoced recently by Professor Richard S. Luli of Yule Luvernity, shows how the heasts actually looked Professor bull a method makes use of meomplete fosol skeletons and defective house. Hitherto, in securit have amply unbedded these in plaster and mounted them on slabs. Professor Luit the ight that wester it among vented a new way of mounting these bones, that shows on our aide the skeleton structure and on the other how scientists think the a rough landed in life. Some colorng is guizuala varies little from or e

parated according to type Skill and care are required for

rentury to another, the skin is



Similaton of a three and a half ton turtle the largest known. On exhibition to the Penbody Moreum of Yele University

thus restoration work. Expert knowledge is needed of the factions of the missies and bones, in order to bind up the flesh

correctly. Whate help may be gained from study of monera actionis, yet the skeletona allow certain differences.

An it teresting example of this povel reconstruction is the "dire wolf" in the Pealody Museum at Yate to New Haven, Conn. The skeleton of this "dire wolf, a grant relative of the modern timer wolf, was four the flu Raucho la Brea far pres, Los Angeres, Calif. In these asymptotic production in of prelistone cays were erga fed, and thed, their bores remaining to tell their fate and give a picture of their

In the new Prahady Museum, recent's opened to the pablic as one of the tuest for collections I the word, It has seen used in an exhibition of ex dution in his og the igs from onere lest a adminer to trust it useff,

New Powerful Swiss Narcotic Is Entirely Harmless

less inrectica for a nestless a aualleviation is one of the most to pertasks of modern medicine. Reseatt Dr. Maurice Sandot, of the Univer-Lausiume, Switzerland, micceeded, it is claimed, in producing a salistance termed "truen pe" which is remarkable for the rapid parentic effects. On cold blooded greatures, such as fish, frogs of salamabeles, two to an murites in a one teath percent solution of trusame induces total insensibility. In this confit on, the animal can be examined through the microscope, and the last mating spacetacle of the blood's circulation watched in all its phases.

If the animal is left a few ponertes longer in the narcotic solution, it becomes perfectly numovable, apparently lifetess. Wrapped up in most cotton wool, it can be conveyed from



our place to ancher It mees a bord nary water out ves it sense. dustely. The new narcolic is unportant in biological work in that its use permits the study of animada without vivienchion.

Assistant of tricarno dilited beyond for pert exerts to soporibe ef

An wared was of one cu-- eeptimater of me pages, t r attit som not hances suffiit money sightly to relater a operations of one to two in entirely painless.

n, unake cocame, is said to be at arroless, can be administ real ter in in large doses to alleviate to has also been usen with

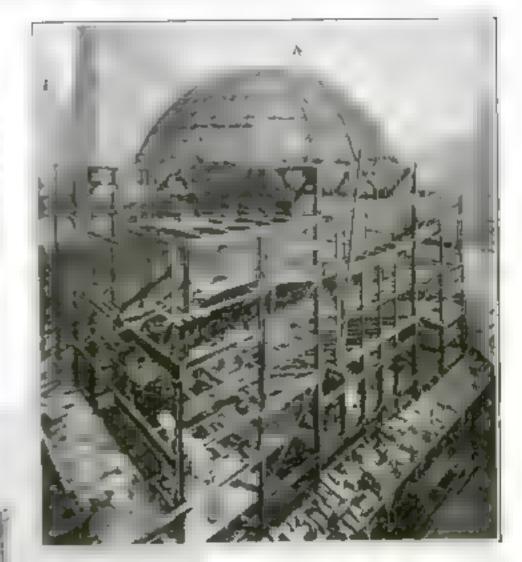
sacras of resend an dentistry a more exterm appearant being sufficient to make the games so a sensative that, for instance, or was an se fitted without any pain.

Giant Cranes in Record Feats

Huge Girders Test Ingenuity of the Skyscraper Builders

Figure 2 - Am York's business floor of a second sec

possesses are produced by the production of the



A Dome of Steel

An end dama office a e 10th

for a sum or present of a

now in lateral of aftern of a li

now in lateral of aftern of a li

which is do not only in new

M. in Testapole 26 Filew 3 sike

TO MILLS I on the sais, and say as feet by the idea of the sais of

A salv final para a sara a sar

and there were not rectant in dameter and there seven feet high. Supporting the rape are exteen steel such rules

Stars to period of the new Madeson Stars to pole and the layer the wide is to have an auditorium 135 feet wide four stones above the ground, supporting twelve stones above it.



Arms Stronger Than a Thousand Men

Lifting the first of eight 144-tun stees girders into its piace 170 feet high on the Parameters building. This is probably the heaviest girder ever lifted to such a height. To accomplish this entraordinary feat, two buge derricks assumed on a traveling platform were used for the work

Stormproof Three-in-One Dirigible Invented by German



Flying over the Top of the World Unbarmed by Ley Winds.
In this picture the artist gives his conception, besed on place, of the new German threeant daughts craiming plantilly and eafely over the frome stratetes near the North Pole

Marimba Vibrato Produced by Electric Fans

SOMETHING cew for the busiest of any in the evel estration the dream operated releases. The posteriorest produced by a magnificancer of denied percossion is remeats by 1- a tradiced in the modern orehestration radio programs. It is said to be no master, and its cobrate master it pressary to roll with the ham. Chords arpeggios and octaves enhanced of master with the pipe organ, it is claimed to the tone produced commerce with the pipe organ, it is claimed to the government and carrying power.

The relicate of the steel bars a produced by electrically controlled rotating facts one is each resonator. The speed control lever on the motor carbles the performer to set the relicate to set the character of the number played—producing a true rox hadrong effect in the steel marinba.

The new instrument is espetially designed for use in accompainments or obbligatos in songs and modern lyne music.



A NEW type of super-arrains which is composed of three units, a parent ship and two smaller ships, one at each side, has been designed by Baron Boris via Louizker of Berna a noted German arcraft and motor engineer. Its inventor casms that it will be absolutely storm-proof. He bases this claim on its peculiar shape, which he believes will make it less easily buffered about by the elements. Its slape he says, will also make it more manageable than a single not

The great sup to be fitted with powerfa copines, will be expuble of terrific speed, and have an enermous

carrying exposity.

Haron von Loi tzkov's slop is actually three slops, for each i at it separate and complete in itself, and a joined to the others with steel cables. It case of accident to comor even to two units, the usualor declares all hands can be transferred to the among mages part by means of gangphross that can between the tents and the defective ones can be cut loose. This feature, he says, makes his ship three it ness as safe and trustworthy as an ordinary drig ole,



A Storm Door from a Screen Door

A NEW toe for snaps hat been found by a manufacturer who has applied the idea to convert screen doors into storm doors. For the waster, a specially treated covering is snapped on and the result is an excellent storm door. When spring comes, the covering is removed, and the screen door reappears.

In this way the acrees door can remain up all year and at all times be protected from the weather. A small window in the storm covering allows the person riside to see who is calling before opening the door. The cover may be attached to any screen door

Venty its achieux sends lave flows over the rim of its crater; the hot liquid usually break out on its sides.

Huge Dam to Form Mountain Lake for Water and Power

GREAT tracts of land in California have hitherto been unworked because water has been lacking. This handleap of nature is being overcome, however, by irrigation from great water basins in the nearby mountains.

The picture at the right shows the gigantic dam of one of these now being erected in the High Sierra mountains of California. It is called the Great Exchequer dam. When completed it will measure 950 feet in length and 326 feet in height, and will form a lake twelve miles long. Three hundred and eighty thousand cubic feet of concrete will go into this giguing barrier.

The water stored in this lofty reservoir will be used not only for irrigation purposes, but also to provide the territory it serves with electric power and light. Water and electricity entering the new farm lands at the same time will open a new chapter in the history of reclamation.



New Oars Let Rower Face Bow

TO KEEP a rowboat beaded for a certain point as one rows with one a back to the bow, requires skill and constant turning of the head.

The newly inverted reversible ones, shown in the picture above, enable a rower to face the bow and row ahead as if his back were to it, or to face the stern an with ordinary ones, it is claimed. The oars will fit in any standard carlocks, or the device that makes them reversible may be attached to ordinary ours.



A Painless Tooth Drill

THE nerve-racking, painful drill that the dentist uses to bore into a throbbing tooth will cause patients no further worry when a new type of drill recently invented in Germany comes into general use, it is asserted. The new instrument has a cocame needle combined with a strill. The corame, under pressure from the dentist's farger, flows into the bole,



deadening the pain as the dentist drills as. The new drill has received many tests, all said to have been successful.

Mr unit objection is that Portion Senser Moveman is the weekly -O E. G. Durbane N C

the laboratory, and then on a twenty-year-old accumulation of diet on an old bank building to Baltimore. How Much Do YOU

Know About Science?

DIRTY FACED stone build ugs now can be steam cleaned so that they look almost as

good as new. In a series of tests recently conducted by the United States Bureau

of Standards, live steam creating was

first tried successfully on diety stones in

HOW many of the following questions can you answer? Here is a real test of what you actually know about the phenomena of nature you are witnessing every day. None of the questions is hard, and all concern thougs you ought to know. Tes off-hand to answer them, and then turn to page 148 for the correct asswers to see how near right you were

- 1. Why does fast music make you feel more active?
- How did ancient surgeons produce anneathesia for operations?
- 3. What is dualified water?
- 4. How do we know that the aun rotates on its axis?
- 5. Does the sun affect the tides?
- Why can you beat up white of egg into a froth though you cannot do this with water?
- 7. What makes the undertow at the sea beach?
- How does a catecpillar turn into a butterfly?
- 9. How do bacteria assist in the manufacture of linen?
- 10. Why does salt make us thirsty?

This Machine Cuts and Loads Corn Stalks



New tractor clearing field of abooked corn

I'm THIS mechanical cal age practically all the work in the felds can be done from the seat of a tractor or other motor-driven machine.

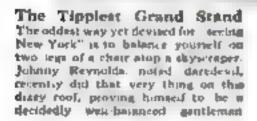
The photograph at the left shows one of the latest additions to the farmer's machinery, a remarkable motor contrivance that goes through a field of shocked corn, cutting the stalks into pieces for feed, and also loading them on the wagon.



Unusual People, Odd Sights,



One of the strangest things about the morteen odd marison automobiles in the United States a where they all go when worn out. One answer a found in the remarkable picture at the left. This huge bose heap of old cars was photographed at Sait Lake City Utab. The metal is salvaged, and the rest goes up in anothe









A Hard-Wear Dress

Miss Mary Tidwell of Temps. Pls. has set the most strument fashion. She week a dress of screen ware fraged with bottle brushes. Rivet decorations are potraria. while locket and necklace are a padiock and dog chain. The hat is a strainer, trimmed to mode



They're All Birds

The mland of Sen Martin, off southern Peru has the thirst entremedinary population on earth. It consists thirdly of Gunnayes bints hundreds of thousands of them Man and unions have treatly allow room, as you can see

Dog Locomotives

The only milliond operated entirely by dog power runs or the and from Nome for native miles. It is known as the Dogmobile Road. Eight dogs ean haul a quarter of a ton of freight from forty to lifty miles a day, and seemingly enjoy it.

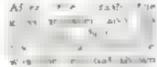


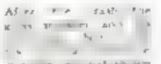
and Out-of-the-Il'ay Places

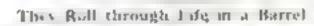


Crash?

ter dish 4 10 1 pt - 64 131 miles Lorder & d. . Tipe a brook 10-5 2 4 ar glass by r







become was there a stump were not one of the to upper by 48 and a particular designed who we had use the state of the said to the said to

This program is the way of edition make a product the processed a lieuwice Christ gray owney the he manique ar

Loring Foreworks

As minimal Printh ? I dv ace or ground for the course of the court of en les There is a market to it are july after agree as mand it is a stage to him in the not perform (t 15 151 4D 'n as an war ordination as a felt dilled writer President to the the against the their we



TH			II. ^b 1	3 0			p d h	ı,f	C	l. Ir	190	١.
							hg					
							40					
13 -	۸			p		h	4	٦.		T 9	1	h.
16.0	3	er f			'n	47	19	٦	Ŧ	777	-10	И



World's Largest Checker baard

Name the American topical gane of rekeasing g same or d rs: we on C rwill y Fla. where he is no squey hard the war of the wife ban teen no a o dok and while return he on writing. Here भोर्क कर या ने वाह was playing there, sometimes with In ar fin dake which they push alwar with TODA Whose store & 17

"Cold Light" Obtained with Liquid Lens



The inventure of the "figure lens," holding and guring into a powerful light made "cold," and consequently safe, by their device

LIGHT without beat, or "cold light." is obtained with a "hutsid lens," by three Massachusells inventors. light that onfiltered would burn the skip or ruin the execupit now can be approached without. injury it is channed.

Various liquida are used for the lens. but the commonest is copper sulplate glycerine It has been adapted to ultra-riolet ray treatments and motionpicture apparatus.

neces make it



Lock Has 1024 Combinations

"IIIS new lock but no key, but is said to fasten more sectively than one with a key I int means the owner, who knows the combination, need have no werry about his key. As long as he remembers the combination, which he has chosen himself, he can open the lock,

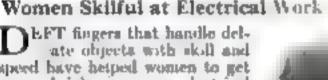
The combination is controlled by a series of ten rangs continued within the padlock and capable of 1025 combinations, of which the owner may take an choice. I se it broads, a may be counged at a sy . Since it is worked by touch, the lock after a little practice may be opened . My in the dark.

Tailors' Dummies Move Heads

MMIES that move their heads, hos, and eyes by means of electes motors concealed with a them, have been devised by Parts tailors to make their modely Lifebke

The faces of the donames are made of a new substance called staff. This is a mixture of fiber and planter that is said to be far

less brittle than the usual wax and to make possible more natural coloring.



speed have besped women to get unusual jobs in many electrical manufacturing plants. In the Western Electric Company, scores of women are employed in making, inspecting, and assembling parts,

Some make the damond dies used in drawing the finer sizes of wire. Others at tuch the filaments. in lany lamps used on telephone switchboards. These filaments are about one sexteenth the hameter of a lumian hair, and the work on them has to be done under interescopes. Ephthing sheets of men to .000M of all meh thick or

firmsier than the themest gold lenf is prother job trat has been entristed to the light touch of women's fingers. Women are also en ployed to wind nots and opcente presses.

At the right, a girl expert is shown assembling exhler on a local synteliboard.

Door Knob Turned by Foot

Discarded Grindstones Make Fine Walls

NEW use for old worm out gread-A stones has been descuvered by a large Philadelphia hardware manufacturing They make excellent walls, either in their original shape or cut into baseks. Broken up, they are excellent for

I wal several blocks long around two sides of the 6a were tract occupied by fors factors as built of these stones. A Direl soor along the Delaware over has a massive retaining wall asso of griadstones.

around the plant and the retaining wall on the river front.

In the retaining wall, the stones were used just as they were discarded from the for ory but for the wall neot od the plant and for the church the stones were carefully squared. No one looking at church or wall ever would mangine that they were built of grandstanes

Old grands ones also have been used as the foundation for roads about the factory.



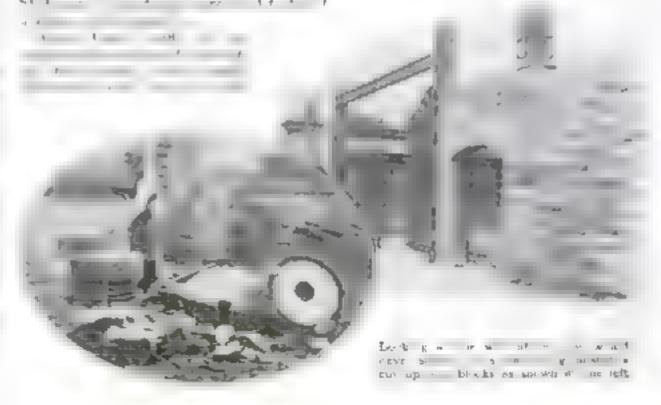
Chain Turus the Knob

IF YOU have over Irred to open a door while your arms hands were foll. you will look with facer on a new m vent a tost enat les one to open a door witnest grasping the killer Stepping on a foot trip automalically tims the knob. and a slight push opens the dwor.

The device, which fits on acv floor consists of a chart attached

from the door knob to a small foot trip fastened on the hottom of the door When this trip is pressed down with the foot, the chain turns the door knob.

The new device, in making the opening of the door easier, will also put an end to kicking and denting the bottom of the door to call someone inside.





A Swing That Children Can Push Themselves

NEW posh-yourself swing is de-A lighting small children who want to swing when there are I may grown-aps or other children around to give them a brook. Chastren as young as two and one had years can see t. It has a sent like a kidder ear, a man debut, and a rest for the feet. Pushing alternately with the feet. and lumbs makes it go.

The awing may be attached on the porch or indoors in attic or besement. wherever the ropes can be fastened independently. For the lawn, the frame

blow wherever a thick mist gathers have been raverted in France. The device is get in motion by the action of the damp use on enlergin carbice. It has been successfully tested, it is much in several French poets where fogs are frequent.



Your relephone receiver stays on the book while the telephone is in use with this new device

Measures High Temperatures

THERMOMETER recording 1800 degrees, or nearly twice as plany as can be registered on any niercury thermometer, has been devised. The take is of clear fused quarts and is filled with galloum, a rare metal with high borning point which has never before had any practical application,

Thermo-complex, up to the present, had to be used to measure temperatures higher than those recorded by mercury thermotieters, but it took mi engineer or a chemist. to operate these. The new restrument, developed by the research laboratory of the General Electric Company, can be used by anyone. It is snown at the left,

A RECORD for counts discovered was made in 1985, during which eleves were noted by astronomers in various parts of the world. Some were lattierta in known, while others were historic visitors returning for their periodic appearances. The nearest approach to this record in the cutyears was in 10cl, when seven were found.

Grass Catcher Fills Evenly

OGIVE the cutting effect of a seisknow, the revolving knives of lawnmowers are set at an angle of about 20°

with the fixed blade This c achts in the 31.18 tings ad he a thrown to coside or the of ir of Diegrassical C er, instead of being evenly des-

tributed. The grass catcher illustr cal bere is pitel sil at an argie, a of ber directly in the path of the falling gra None is stalland the catcher is filled uniform. ly. A partition inclined toward the front keeps grass from pusoing out again after 11 is once caught.



alsown in the photograph above is used.

Sear-serverese Eighorns that begin to



tached to the inverted receiver, and requires no change in the

telephone. The receiver hook

is controlled by a lever, which

is clamped around the post and

ramen the book and receiver

Free Shade Provided for Automobilists

ITOMOBILE gasoline and service A stationa have been giving free air these many years. But now comes a considerate gas station proprietor who is providing free sande for tires, sweltering motorists. Out in life West, where trees

are few and far between, this service is sure to be appreciated.

The shed, with its sign of invitation, shown in the picture below, was exerted m Bradley, Calif., and a giving relief daily to hundreds of grateful, juded patrons.



This "Yree shade" station ofters welcome relief to mosorism on sun-baked roads

Interesting People;

America's Youngest Pilot

THE youngest licensed air pilot the United States is said to la F roan Parker fourteen years old of Yaderson, Ind. who recently possed the necessary tests with distuction. He has been flying for care wears with his father who is

i reer avsator, and had no the lty in obtaining a license. i coman was born in St. Paul, Morn., but has lived most of lasble in Indiana. The picture at it right shows the young avan- adding in front of the plane that a spes in making his flights.

> AN ELEPHANT'S IUSE filled with gold was discovered recently by a group of explorers in Alaska, During the centuries the task because borned and foseabzed and gold miggets were imbeddoct in the ivory. The

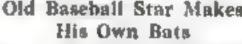


Old Baseball Star Makes His Own Bats

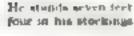
AST year "Red" (J. Carbsle) Small-# former National League baseful. r, led the Southern League at sat right less year be hopes to repeat with two of los own making. In the picture at the left he is tirring a bar handle on a bette under the gardonce of C. M. Highes, a notest but maker of the

of the percentional Boston Brayes in 1914 when they walked off with the World's Scries for r games straight. He has been out of the usa, or leagues for some venes, but is still going

strong a the course



South, at Atlanta, Ca. "Red" was the star thard baseman



Young Giant Engineer Runs Miniature Train

THE interesting photograph above whose the youngest and tallest loss. partive engineer, Jack Farl, of Venues, Cast, and the smallest engine on the Pacific coast. Jack and the engate which he gans are among the principal attractions of Venice. The contrast, as seen in the partire, is atur stag-

Jack, who is mily fifteen vesicold. star on seven feet form melies in his stocking feet and weighs 237 pounds. Huls will grown at The largest overalls he could find were more than a foot foo short, so he had to have percentabled to the bottoms of the legs. If you look closely at the preture you can see the seam in them.



"Red" Sorich turning a int handle

Fine Violins Made in Home Workshops

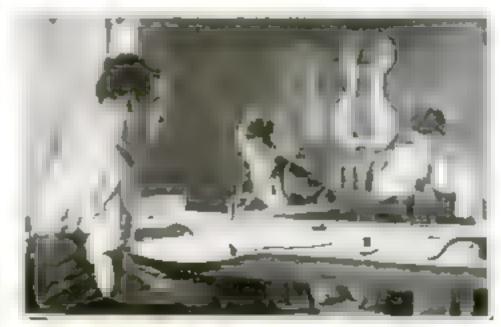
LRGE factories turn out every year thousands of vicins made of the finest woods, thorotagit's sensoned, exact repleas of the old masterpaces in every

detail. Let for all the cure in their monufacture, they fad to approach in quality the fine old instruments of Stradmarris, Amati, Guarnerus, and the other great masters of the Cremona school.

When the old masters ded, the serrets for the production of these wonderful viotosched with them, but certain of the traditions of fine violin making have lived on and atill Sourish at Mirecourt, France, which is now the violin center of the world

The Mirecourt violing, which are the nearest rivals of the old master instruments. are made not in large factories. but in home workshops such

as the one seen in the partire below There all the parts are fashioned and put together by hand with all the patience and care of the old masters.



Making violius in a bome weekshop at Mirecourt, France

Grafts New Eyes on Animals

FFFR several years' experiments, A Professor E. Guvenot of the University of Gerieva has succeeded by ejenttig sight on auctirals are, dopes soon to extend has work to human beings. He

> Corec from is as line subjects of a supportant experience is,

> The optic nerves of the In housewere is faund the eyes extracted. Toeu, after a certain period, he grafted new eyes in the orbits of the ong parones. In eighty-four cases he has worked on dura g the past eleven months, orly three have been corppieto successes, but these three prove conclusively, he claims, that he is on the right track.

> Grafting eyes on inferior vertebrates, he says, is not more difficult than grafting heads, tails or legs on them since it is possible to renew a connection with the brain

Their Unusual Jobs

He Made This Tractor Himself

A HOMEMADE tractor of novel construction is the proud possession of G.F. Erikson, a pumping station engineer of Bowdle S. Dak, With the exception of the engine and the transmission, it is entirely as own work.

is entirely his own work.

The power for the tractor is furnished by two Model F Ford engines which he has connected tardem fasmon, so that the single crankshaft receives two impulses on each revolution. The wheels, frame, drive prinon, rung gear and all the other partit of the tractor Erikson made I moself in his home workshop, where he works evenings, when his day's work at the punishing station is over

In the pictire at the right, Erikson is seen proudly delving his odd looking but efficient tractor out of the shed.



Music Lesson atop a Bridge

TAKING chances is not confined to any one class of workers. The pictore above shows Ross Gorrian, a New York saxophone teacher, giving at the risk of builden lesson to August Sacentino,

a painter lingh up on Brooklyn Bridge. New York City where Sarentino is working

Perched a gh on the sway ing cahes, Sazen mo mus his sen es while the teacher holds more for him. The lessens are given during the miph s hanch hour, and to save time the teacher chinhs up the rigging to the place where Sazentino is painting.

Apartment house dwellers who have to suffer from beginners' efforts on musical instruments will approve heart-dy of the idea. If one must learn to play a sayophone it is hard to miagine a better place to practice, say they, than on a high bridge,



Noted Potter Fires Kiln Only Once a Year

WHAT Wedgwood in to chmaware, that Delaherche is to pottery the finest of its kind. The French pottery is remarkable for its wonderful glaze, its perfect shape, and its exquisite coloring.

Comparatively rare, it is nigely sought after by collectors, and in

accordingly high priced.

While many know and adouse this pottery few know anything of its maker and its maintenantacture. It is made by Auguste Delaberche, an old Frenchinan who lives at Armentières near the town of Benuvais, famous for its tapeatres. All his pottery is made from elsy that he digs in his own garden. And he has ideas of his own about his work.

Throughout the year he makes a considerable number of objects, each to use in its way, but he fires only once a year. At this time he stands by the kiln for their bours without sleep, to be sure of an even heat. Even leat, he says, is the secret of the wonderful glaze that makes his work stand out from all others.

Desaucrelie is shown in the picture at the right silling in front of his kills. Because of los logh profesency, he has been called the Delia Robbia of the century. and the master potter of the world. But he is sometang of a pholosopher, too, and many visitors seek him out to listen to his shrewd remarks, based upon years of observation and sound thinking.



Capitol Gavel Maker Busy When Congress Meets

FOR twenty years, J. C. Pakin has been official gavel maker of the Capitol at Washington. During that period he has made all the wooden muliets used by the presiding officers of the Senate and

the House of Representatives.

Although the gavels are made of the most durable wood obtainable, in the excitement of debate they frequently are broken in the speaker's endeavors to restore order, and the gavel maker is usually pretty busy keeping a sufficient reserve supply on hand. In the photograph Pakin is shown working on a new gavel head, which he is turning on his lathe.



J. C. Pakin making a speaker's gavel

Making History in the Art



Abeye ser a sis		4- 4		
H dorse who start it we		P		1
orye an mon				
a space of the same				
was the state of t		4		
fing 2x 2 A A				~
profit programmes the second of the			- 6	A
of to Market to T				9.7
print to the collection of the				
ar a raistite. Fra long row he	1,01,01			
corn in a nome of the property	4.4			





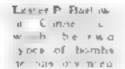
April , was a Bomshors

ri,					Ŋ		F	
				11 0	li.			
			- 4				- 10	
						-	11	
ш	2	 11.	40	11 %	- 12		- 11	

Ship a Complete Fixing Fald

The quie was as exists in the problem of the quie to the problem of the problem.

of Aeronautics



Navel Air Bambs of Huge Size

A new man for bounds

The primary of a bounds

The form of the bound of

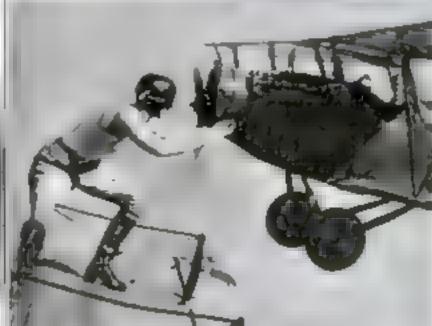
The transfer of the transfer of

The transfer of the transf

pre the







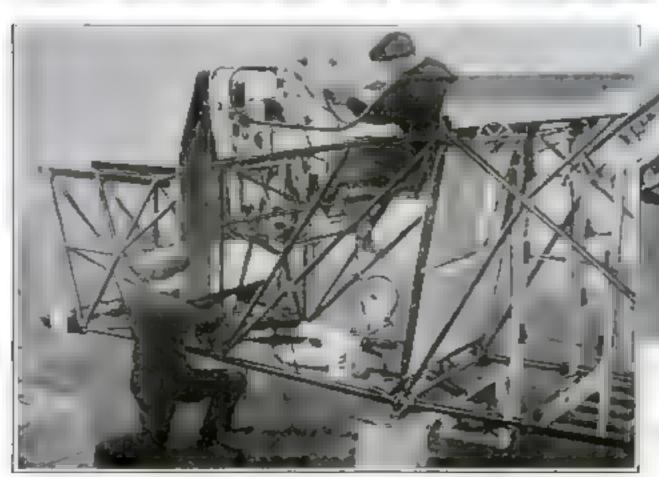
She Changes Planes in Air for Thrill

Mas Goodyn Rogic Don Me thought and A. Corbe sometimental at title let be at if it even p bart all Lin Angeres greeng ing the life and larger through, as bucy perfor and Dieir daing frets high elevethe sty. M is Bogle too to the spe o to gue his amp couly a the front that plate tomother The a Code from any was fire well Shore was a Mass P gir his non-wat about thinks for the may change A in hit a lose snows re or or receive a or h note of the second plents

Uncle Sam's New Bombers Made for Speed

A dispersion ight hemits a stance entire of a stance of a stan

to the a hearing to set who teacher and the set of the



Builder of New Speed Planes

Thomas H. Huff whose part at appears above, is the president of the Huff Deland Argume C. other of Berni d. Pa. or which his is Sam has an outrouther most action of all the new light bombers of the species. Peganas type

When the American Eagle Is Captured



James R. Garen with an engle captured in the Pennsylvania mountains after a storm

FTER a recent storm James R Gillen A of Ambler Pass found we American golden eagle near Fort Washington almost dead of expansion from batteng the el ments. It was too weak to resist and Cellen took it home. The bird has now fully recovered but a still in captivity It start yet fill grown but it bas is total wing spread of fully six feet four inches.



Two fine specimens of American eagles, and the four Utah National Guard officers who caught them in the mountains of Utah. Note especially the magnificent agreed of their great wings

Officers of the Linh National Guard tramping through the mountains near Bountsful, Utch, discovered two American eagles on a ledge. Stealing up on them they seized the great birds before they could get away. The struggle that ensned was lengthy and ficere.

The engles fought with heaks and talons and were subdied only when completely exhausted. The officers were bitten and scratched and their clother were in ribbons when the battle was over-

Although emptives, there is still fight in the burds, as the picture shows.

Blame Snails' Sweet Tooth

wresked the sugar growing industry of Lori statin, the United States Depart-

ment of Agriculture has a mosticed.

As many as 150 of these lattle monda

laive been counted about the roots

of a single paget. In their attack

they was regarded which are assord by micro-organ seris from the son.

SMALL mad enuses the root-A rot disease, which has almost

Strawberry Patch in a Barrel

QTRAWBERRIES cough to supply a finish for a senson can be grown in a larrel. This has been dense atracted by Delayat D. Job ison, of California, as phown at the right

A burget to watch is less of sufficient roge for a strawbeers plant have been bored is fitted with dist. In each of the black time a set, and under each vine is built a screen pastform to support it us it grows and begres front. The harrel is set on a platform some distance from the ground, to make sloop-DRE ODDICCOSSILIA

As analog assently veries can be passed prove corret. By this (a) thou hundreds of years can be cultivated in a restricted area. The berries are said to be better. too, because they get more ann and asand are not so eramped as when they grow on the ground.



"13" His Lucky Number

TIVE me the thirteen every time " G says B. A. Metroldrick, sumber anufacturer, of Spokane, Wash, woo exhance these under the lucknest he ever and If we finded to get an a do beer se - though a PI in it he would be greatly esappointed. It is the sast six years he has had the imprises 18,000, and an all that time he have t been arrested or had at asystemt. He carries the six numbers in a special frame in front of his radiator



Three of These Texas Lemons an Armful

Lemons to big as grapeficit, called "Ponderosso," as shown above, are raised in the lower Rio Orande valley in Tunas

A GALLON of juce to a leason! That is the way they figure for lemonade in the lower Rio Grande valley, Texas. This is, of ecoses an exaggeration But you may not think it very much out of the way when you note the size. of the lemons.

Three of them make an armful, as may be observed in the meture.

These lemons were part of a deplay of Texas agricultural products held recently in Kansta City Mo. The name of the fruit is "Ponderosa," or, translated into plain English, ponderous.



The bood of the automobile of B. A. McGoldrick, who believes in number 13

Girl Artist Fashions Mosaics from Egg Shells



Skill FD we recent notably of Chona Japan, German and Leviller of the turies have empleed sea shells in racker odd and astronations and the seasons are test time, it is be need for a personal propose.

After examining some specimens of the older shell work, Miss Nelse Isaac, a New York artist, was struck with the possibilities of the humble egg shell. She tried out her idea, and the resist is a new craft egg shell mosaics for the backs of brushes, for courts, powder boxes, pin trays, and mirror frames.

How the effected pieces of shell are arranged according to a chosen design and are glard to an orticle by stalful hands

The shells are broken into small pieces which are carefully fitted together according to the desired design, and are then glued on to the article to be deco-

rated. The utmost care is necessary of the bandling.

first even in the taken in it rail after incomes a

When the plan has deted the shells are partial in various edge. The surface of the base edges are me smooth as I does not clup easily, making it almost as acryicentic as the sea alical mosaic.

Six causes are to be string across a span of 6,440 feet, or nearly a mile and a quarter, to carry power across an arm of Puget sound into the city of Taconia.

How You Can Grow a Pearl

IT is possible for anyone to grow pearls such as the Japanese have succeeded to producing. Charles L. Edwards showed has nature study classes in the Los Angeles public schools how to do it.

He put a hard bend in an abalone shell and then left the molesk alone. When he opened the shell the bead was not to be seen. Instead, sha k to one wall of the shell was a pearl that the abalone had f rived by covering the irritating bead with layers of pearl film, its own protective secret ons

A pearl stack to the shell in this way is called a blaster pearl. It is generally set in jewelry with one side flat, but it can be peeled like an onion to make it round. In doing this, however, its size is somewhat reduced



The pearl on the shell, pointed out in the picture, was formed around a small boad



Postage Stamps Make Colorful Bedroom Set

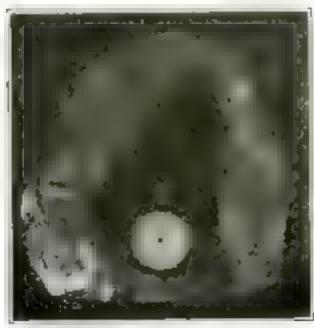
CANCELED postage stamps have been put to many uses in the past, but Mes. Josephine Farrell, of Waithrop, Mass., now has found a way of employing them that is both novel and artistic. She has used them to decorate a set of wooden bedroom furniture. Thousands of stamps of all denominations went into the elever and greatly varied designs, and the gay colors of the stamps produce a striking effect, as seen in the photograph.

Collectors have shown much interest in the furniture and have made many tempting offers for it. Henry Ford is reported to be one of those who have tried to purchase it. Two Missot in farmers were startled recently by a meteor that landed only 500 yards from them. The meteor made a hole in the ground four feet in diameter

Ideal Optical Glass Produced

A PPRFECT optical glass, free from all flaws that are sometimes found in optical glasses, has been produced at the United States Bureau of Standards where it is now on exhibition. The watch in the dlustration, was photographed through four nicket of this glass, but every detail is as perfect as if there were no glass between it and the camera. There are none of the usual distortions caused by flaws or scratches,

In the original photograph, even the smallest divisions of the dial stand out with absolute distractness.



The piece of glass, through which the watch was photographed as shown above. It four inches thack and absolutely clear and perfect

Wood Mentol Mentols

How a Great City Protects Its Food

THE AMOUNT of food consumed in New York City in a single year would fill a freight train extending from Havana. Cina, to Alaska! With its population of nearly 6,000-000 residents and to follow a very conservative estimate—of 1,000,000 commuters, every day at lunch time 7,000,000 persons are rating in the largest city in our country. If freen thousand restaurants serve 3,000,000 persons daily

These figures give but a slight idea of the vast quantities of food New York City needs, and the herealean task it faces to safeguard that supply in a greater or lesser degree the same problems confront every city in the country

From the time it gets to the terminals until it reaches the table, food in the giant metropolis is closely scrutinized by an army of inspectors. They board the trains at the stations and the

ships at the piers. They follow it through from the wholesale markets, to retail establishments, pushearis, bakeries and restaurants. For some feeds, such as nulk and some kinds of shed fish the inspection begins outside the city. A net of inspection is special through nearby states examining foods at their sources.

Last year these aspectors concerned food enough to fill a train of cars foot males long. Spoiled, adolterated, and postoners foods are quickly discovered by the keen-eyed, vigdant health guardians.

All doubtful foodstuffs are analyzed in two municipal laboratories, one for detecting inspurities and adolferation, the other for examining milk. Both are maintained by the city under its bureau of food and drugs.

He Guards the Milk of New York's Millions

Determining the percentage of fet up a mile sample as the mile saboratory of the New York bureau of food and drugs. Protecting the people from impure mile is perhaps the e v's biggest task. About 3 500 000 quarte of mile are consumed daily in New York

Eggs Must Be Candled

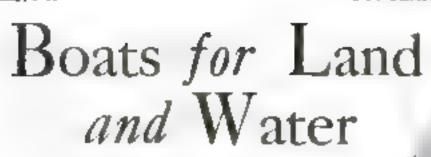
New York consumes \$5,000 000 dozens of fresh, and storage eggs yearly. Besides these other millions of froren and powdered eggs are used for baking. More than a million pounds of frozen yolks and whites come into the city every year from Chena slane. These are tested by amell and taste, while the whole eggs are carefully candied. The picture above gives an idea of bow eggs are candied.



The purity of butter is decided by taste and odor. Dr. M. A. Herzog of the health department, above, is testing butter before printing and wrapping

Ice-Cream Weighed

New Yorkers and 15,000,000 gailous of ce-crosm a year, or two and a half gallous per person. The fat content for all this see-resum must be at least right percent. At left, an assistant to the municipal milk laboratory is shown weighing a sample of rec-crosm



Half-a-Dozen Ingenious New Travel Ideas



The large matter has no mag of the bear inhorse with a proof of a given so when if the states who I Shephers. I would be a state of a war proper to large one on war and has a single and a bear a state one.

Takes Visitors Out to Big Boats

The property beauticular, the state a samp product had been engineered angularly to beautiful the water of agree passengers they be beautiful to be been agreed to be been agreed to be a supported to the passengers that the constraint a safet a passenger that the constraint a safet a passenger to be the safet as a support to be supported to be suppo

Complete Boat on Acto Chassia

The cent on the grade beginning to go to make a major of major of the company of

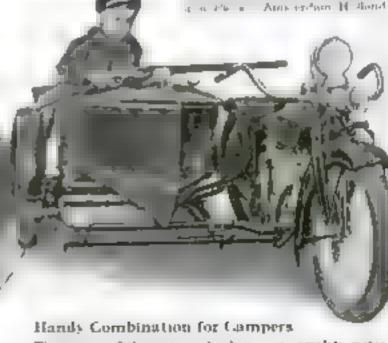
A Pricycle Bout

I me the color to be two equations of the color to the co



A Breycle Runs This French Boat

The series the sentence in the composition by the what is the meaning purpose and product that beath sales and water. The for the or Merical Contract of Product is a contract of the product of the prod



The sile as of the motor-yells above is a complete motor book hat an be detailed easily from he motor is the it was releasily put on exhibition at the Motor i, its Show held so the new Machine Square Gordon, in New York City

Thought Messages Stir Controversy



A Thousand Persons May Hear Man's Heartbeats with New Device

It is possible, it is elegant for as many as a thousand presons to listers to a man's hearbests transin trid by a stelloscope with a new device recently invented by engineers of the Bell Telephone Laboratories. New York. The photograph shows H, Clyde Snook, of the Bell inhoratories, holding the stethoscope transmitter to a subject while three New York sucho and electrical engineers listen in

Knowledge of the latest advances of science is one of the greatest assets of the mind. It develops depth of thought and breadth of vision. In its application to daily life, it is of immense value. In these columns we endeavor to dive you each month brief accounts of the latest scientific discoveries that may be of practical terrice to you

TELEPATHY soon may be added to radio, telephone, and telegraph as a means of communication with distant persons. Notable progress has been reported by Professor Vlaction Beliteray of Lemograd Academy of Seiences, Russia, who by capturing the electromagnetic waves thrown off by people, clauss to have succeeded in transmitting thoughts.

Dr Ivan Chakhovsky, a Moscow physician who took part in Professor Behterev a experiments, substantiates this claim, and declares that in seventy percent of the cases Behterev was successful.

Professor Behlerey's is the third annotherment from Russia recently on telepathy. In 1925, Professor Skripsky of the Leningrad Electro-Technical Institute told of an invention to determine everybody's "electric characteristics" by recording human electromagnetic waves. Early this year, Dr. Kosh risky of Moscow claimed to have transferred human thoughts from one person to another

American psychologists are for the most part akeptical of these claims. Some reject them entirely. Dr. J. McKeen Cattell formerly of Columbia University, and Dr. Edward L. Thorodike of Teachers College, New York, doubt the success of the Russian experiments. Professor Couvel, head of the psychology department of Stanford University, which six years ago

received \$800,000 for psychic research, recently declared, after 10,000 attempts, that telepathy is impossible,

New Uses for Ultra-Violet Rays

NEW uses for ultra-violet light, that invisible part of similable whose magic effects on health were discovered

only recently, are being found almost daily. In Paris, the powerful light as heing used now to bring out texts that have been crased from old parchments. Even though the parcliment has been wrillen over age is it is soul, the original letters will come out. Very mteresting discoveries of old chasnes are experted to be made under this treatment.

The Maine Agricultural Experiment Station recently has been giving cows a daily bath of ultraviolet light from artificial lights. The milk that these cows give, it has been found prevents sickets in babies, while milk from cows not getting treatment is useless in preventing the disease.

Progress of Science at Home and Abroad

In the summertuse, cows out in the pasture get their doses of ultra-violet light from sunshine, but in winter stables this is denied them. The time appears near at hand when every stable will be provided with artificial sunlight for the long, cheerless wanter days.

A Lead Cancer Cure

NEW hope has been given recently to sufferest from cancer. A distinguished English surgeon, Dr. W. Bisir Bell, claims that he has been able to care the dreaded disease with injections of lead. A professor at the University of Liverpool, Dr. Bell has been testing out this method for seventeen years.

The metal is sujected into the veins near the cancerous growth. Out of about 200 cases treated, most of them thought hoperess. Dr. Bell, declares that almost lifty are now believed to be entirely and permanently cured.

A Novel Way of Keeping Fruit

A front from sporting has been found by Professor John McLean Thumpson of the University of Laverpool, England. He puts the fruit to sleep, he declares, in which state they breathe very slightly and keep perfectly for a long time

The fruit is put in a room and kept at a steady temperature and degree of



Vibrations to Be Firemen of the Future?

Fixes in the fature will be put out by tone vibrations, according to Charles Kellogg, a Culifornia naturalist, who is showing New York fremen bow it can be done. Each building, he says, will have its own pitch, and the vibrations produced by a "tuning-in" process will extinguish the fice



Relics of Ancient Bubylon

Above, Mist Orace Stockmen, of the Smithconjent Institution, Weshington, D. C., is examining three inscribed clay disks dug up in succept Brech, Sabylon. The largest contains a schoolboy's exercise: the small ones are bills of asies for goots. They are about 4,000 years old

hemselve text it becomes dormant. Then it can be kept anywhere. The method has been tried on granges, nuts, grapefruit, lemons, and apples.

If further tests prove successful, we may see on our fruitstands strange tropscal and oriental fruit that never reached our country before on account of the prophitive cost of cold storage shapping.

Blackbird Best Singer of Tribe

IN A singing contest between bods, the backlerd would win, and Professor C. J. Patter of the Royal Institution. London For the blackbird keeps the best time and rhythm and his song has the best time. A thrush however, could best him in endarance, some thrushes being may to sing sixteen hours a day.

Breds have three kinds of language, the professor says—alarm notes, call notes, and soug. Alarm notes are for trouble, whole call notes are used by young breds erying for their parents or

by older birds when mating. Songs that we think are expressing joy, this hird specialist says, actually are not. Most ords really are saying. "Look at me—how big I am—how log that I have the songs are expressions of prole."

In the laboratories of Princeton I haversity, a new way has been found to make hydrogen peroxide by combining hydrogen and oxygen directly. Shortening the process will mean cheaper antiseptics and perhaps cheaper dress goods, since hydrogen peruside is one of the most important bleaching agents.

France Leads in Flying Records

PRANCE leads the world in aviation, having forty-five world's records. The United States comes next with thirty-three, with Italy third and Denmark and Holland tying for fourth place. These figures are given in a new chart published by the French air ministry.

Locien Boussoutrot a French airplane priot, recently made a world's record for altitude and duration of flight with heavy loads. Carrying a weight of over six tons, equal to that of sixty passengers and baggage, he rose 11,482 feet in fifty-five minutes and remained up one hour, twelve minutes and twenty-one seconds. In this flight Boussoutrot broke eight previous records, seven of which he himself had made previously

Men Think Better under Strain

YOUR easy-going, pleasant fellow isn't going to get there as fast as the man who grits his teeth, knits his brows and holds his muscles tense.

A series of psychological tests was tried on persons while they were gripping a dynamometer, a pair of hand grips with meter attacked, and then repeated when the subjects were sitting in relaxed positions. The results showed that the persons could think much better and faster when their muscles were under tension

A Rockefeller Gift to Egypt

A GIFT of \$10.000,000 for the erection and for the establishment of an archaeological institute in connection with it at Carro was recently offered to King Fund and the people of Egypt by John D. Rockefeller, Jr. This mim, believed to be the largest ever devoted to archaeological studies and research, was proffered as an expression of the friendship and respect America, the newest of lands, holds for Egypt, the oldest nation in history

Egypt's wealth of ancient monuments and marvelous pieces of art has increased in late years beyond the capacity of the present museum of Cairo. A research institute in connection with a new museum



Cure Found for X-Ray Burns

A core for X-ray bures, that have claimed so many victims among doctors, has just been announced by Professor d'Arnonval, the noted French scientist, shown above. With high frequency currents d'Arnonval scientily effected a complete cure for Dr. Debedat a Bordenux rediologist. D'Arnonval, whose special field a electronly after years of research receptly declared that death by electric shock is prevent oble, and efforts to indure respiration immediately following a shock should be continued at least two hours. In the photograph, Professor d'Arnonval is standing at the high-frequency machine used to effect his remarkable currents.

will be of untold service to scholars from all parts of the world in following out their studies of early Egyptian lostory. It will also provide the best scientific training for students from Egypt itself.

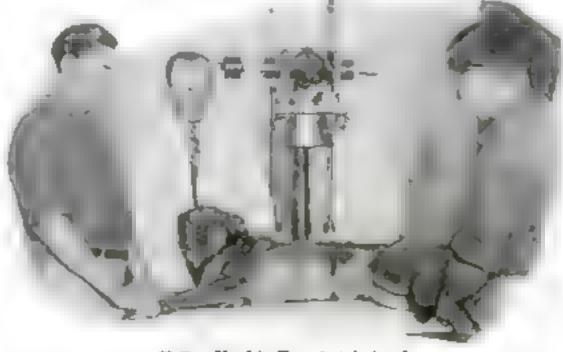
Building Material Made of Straw

A NEW fireproof building material called solonite is a recent French invention. It is made of straw, and is cheap, light, durable, and soundproof. The straw is pressed into large panels nine feet long by six feet wide and two inches thick, bound together lengthwise by wires six inches apart. The heavy

pressure to which it is submitted and the nuneral content of the straw combine to make it theroughly fireproof

The material has been found to be excellent for side walls, ceil age, and partitions, and makes a fine surface for plaster and stuced. It has been used extensively recently for summer cottages and for the soundproof booths in phonograph and radio stores.

To FIND a serum for pneumonia, one of the nation's most deadly diseases, Lucius N. Luttaner of Groversville, N. Y., a former congressman, who lost his wife from this deadly disease, has given \$10.000 a year to New York University.



X-Ray Used in Treating Animals

The Ellin Prince Spayer Hospital for Animals, New York, which treats thousands of siling animals daily, is said to be one of the finest of its kind in the world. The picture, taker in the X-ray laboratory of the hospital, shows a surgeon X-raying a dog

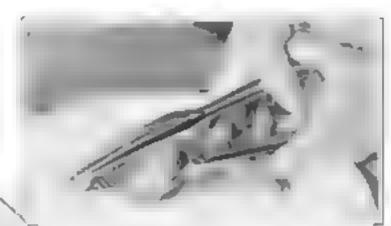
Novel Devices Lighten

Eighteen Handy Ideas, All Designed to



A Useful Long Fork

At last the clusive office or pickle at the bottom of the tall bottle in benten. The fork, below, will get it. It is just a long wire with a handle, and a creak at the end, but it will often prevent canoperation at your pickle.



Cracks Open Clamshells

Somewhat like a nuteractor but for more powerful is this tool (above), that will break open clama for you. The rough sides grip the clamatical family, and pressure does the rest



A servent is scarcely needed in the kitches equipped with so versatile a machine on that shows above. It does all sorts of kitches tasks. It does mixing end beating, polishes silverware and cutlery, grinds meet and coffee slices vegetables, emakes ice, turns the occrease freezer and sharpens knows. The remarkable thing about this kitchen unit is that only one small motor is used to do all of these kitchen jobs. The grinder beater and so on, are separate attachments, which can be quickly clamped on or taken off the device.



For the Nightly "100 Strokes"

The maker of this heir brush had a new idea. He put its handle on ha side instead of on the end and made it half as long as the ordinary brush handle, so that it can be pecked un less apace. The brush may be cleaned in boiling water without bertains or loosening the bristless



an orthogy chopper To work it, you aimply push the device back and forth

Unique Vegetable Mincer Sharp revolving knives in the single tool, shown above, mince cabbage and other vegetables in helf the time it takes with

> A Hook that Folds Up When not in use, the garment book at the left springs back natural reveneed bolder so that it is entirely out of the way. The weight of a cap is may parsient hanging on it balds the book down, but when it is taken off the book maps back to its recess. It is easily acrewed

to a door or to a closet well



If You Like Your Pepper Hotif you like your pepper with its full flavor,
you will get one of these little pepper
grinders, made of gless and metal, to use
at the dinner table. You can grind the exact
quant ty you need, and see it so you grind

Egs Cutter Prevents Waste

Opening botled eggs served in egg cups is usually a mussy and wasteful performance. The latter sciences pictured just above does a clean job, cutting the top of the shell quickly and evenly



A most oneful article around the hitchen and the hitchen and the boune is the compact handy combination tool, illustrated at the right, that will sharpen known with a few strokes, remove milk bottle raps, turn acrews, remove fruit jar lade, and open bottle tops

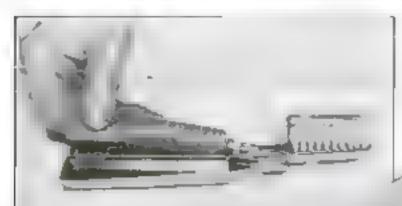


A New Way to Cook

For the bechelor girl who has no grill, here is a capital idea. Turn your electric cross apade down, alip it into this metal device that camps, as seen in the picture above, on the edge of a table, and there you have a cooking plate. The holder will support any one of tron you may happen to have. Careful cooking won't spoil the iron.



Save Time and Energy for the Busy Woman



For Quick Pastry Making

A pie that is made in a hurry will be just on good as any other pie if the crust is properly mixed. The device below maures proper mixing in a few mitutes. It is bent-shaped, and made of fine crossed weres which blend the flour and fat together to record time



This toothbrush carries its pasts in the handle. Pressure on the tube forces pasts on the bristles. The brush can be replaced, A metal cover slips on the brush when not in use, and the handle folds over the tube



An Apple Corer with a Spring

The particular ad vantage of the report poer at the left in that the core can be removed just as far as is wanted. The bottom can be left in the apple to retain the luces and sugar in baking. A spring cuts the apple clean.



New Mop is Self-Wringing

A twist of the plunger in the handle of this map wrings the mop dry. The mop fabric is removed very easily and, having a firm conspices at the bottom of the temp, it can be used to rish hard on apota on the floor

Removes Corn from the Cob

Compain we used measures as the grange of ange of the standard we as other a girls in a second per set to get a the first and a second second



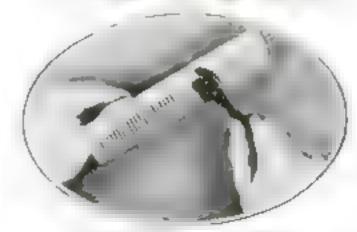
This Drainer Doesn t Drop

One of medicantege of the primary and the grant with the grade and the g



Library Table Hides Complete Electric Kitchenette

According to a Queen Anne when when mery me to a think of a very me of it is a rempte to a hear to able to be a rempte to a hear to able to be to a purpose that the earth of an earth of a the top of an earth of



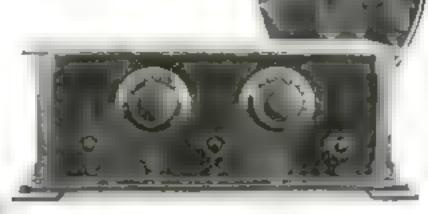
A Brush for Cleaning Combs

has est aless a ar nomb on a fix with the peabeach made cape of the that purpose. The brown role made is polled or one that the the of the cumin

Radio Builders Win Prizes



Judges Announce Cash Awards in Our Unusual Construction Contest-How to Build a Set Like the First Prize Winner's



The Winner of the Second Prize-\$50 The bulmer of this set is B. O. Burgin, of Albany, N. Y.

II to 50% of. His workmanship to faulticus, and the de-

commission novel adver a mushamed under construction.

the table connot coust ringing noises. All the connec-

total to be excited terminals are made by flexible leads

head of the science department of the Albany

its cocket to supported by the subbenies that jurning

This Receiver Wins First Prize-\$150

Francis Corter Turner, of Middleburg, Va., who is signed and built this remarkably fine set is shown to the walabove. By occupation a farmer and stockmen or has made sudio a hobby for years. Complete, do a of its atractions telling you how to build this prace a noting set efficiently and economically are given on their pages

MROM hundreds of entries from all parts of this country. Canada and the Philippines, the officials of the Popular Science Institute of Standards acting an judges have relected the prize winners in our Radio Construction Contest, which was amounted last December

This contest, which was open to ratho fana everywhere, called for ingenuity and careful workmanship. From a given number of instruments and parts, and from a specified wiring chagram, contestants were asked to build a complete ratho receiver—the very best possible. Entries were made in the form of photographs of the completed receiver, from which the judges selected those which gave evidence of the best workmanalap. These, then, were put through actual working tests in the laboratory of the Popular Science Institote of Standards.

Five receivers were chosen for the final channation, and when they had been received at the Institute's radio laboratory, they were put through the same tests applied to all the commercial receivers which are sent in for approval.

The three prize winning sets are all excellent examples of radio design and construction, the judges declare. All three tune sharply and bring in stations in a way to satisfy the most exacting radio fan. Their makers have reason to be proud of them. The prize winners are as follows

First Prize, \$150 - Francis C. Turner, Middleburg, Va.

Second Prize, \$50 — B. O. Burgin, Albuny,

Third Prize, \$25 - Raymond Hoffman, St. Mary's, Pa.





Third Prize Winner-\$25

Raymond Hoffman, of St. Mary's, Pa. built this seat and efficient core ver. He used a glass panel mounted in a cubinet with sloping front

Honorable Mention — Robert Black, Easthampton, Mass., and A. Thomas Nieman, Chicago. Ill

Mr. Turner a receiver is, in the opinion of the pidges, one of the finest three-tube regeneralise sets they ever have examined. The design not only is unusually attractive, but is almost perfect from a theoretical point of view. The mechanical construction is equally excellent.

The cabinet in which the prize winning set is housed as odd and original, for it is in the form of a sea chest. Since, however, cabinet construction was not to be considered in awarding prices, the judges noted only that the receiver was fitted properly into the space provided for it and that the complete set was pleasing in appearance.

Because of the dimensions of the front panel, you will find, if you build this set, that it will not fit in any of the standard arses of racho cahmets. It will be up to you, therefore, to decide whether to build a aloping front cabinet or a square cabinet for a vertical panel. The only change recessary in making the parel vertical will be to a ter the angle of the brackets heading the sub-panel to facfront panel.

The worder of the first prize is an old timerat the radio game. Although los regular business is farming and stock raining, he tests us that radio has been an absorbing hobby of his since away back in 1909-before broadeasting was even thought of

"After making a selection of parts to boild my contest entry," he writes, "I provided myself with several sheets of paper, a ruler, square, pened, and plenty of elbow room, Then there began what closely resembled a chess game. The radio parts took the place of men, and after I had moved them about until I recured an arrangement that looked promoung, I marked their posttions on the paper and started in all over again with a fresh sheet. Eventually I fut on the arrangement that was incorporated in the radio receiver that I built for "

PO BUILD a radio receiver like Tur-I ner's, first decide on the parts you will use. Almost any standard parts will do, and you can be sure of their efficiency if you purchase only parts approved by the Popular Science Institute of Standards.

These are the parts you will need A, B, and C-Any standard threeerread toming unit

D-Variable condenser (straight line frequency or plant type with espacity to suit coil B of the tuning mut).

E-Fixed grid condenser, .00025 mfd. F-Fixed condenser .0005 mfd.

G—Fixed or variable grid leak.

H. J. and K. Rheostats. L. M. and A. Vacuum tube sockets.

O-Medium ratio audio trai sformer

P— Low ratio audio transformer

Q -Double cornet jack

R -Single carenit jack

A Filament switch 7—Front panel, 9 by 14

t close.

U Sub-panel 6 by 13 niches.

I and W Sub-panel

Two deals, 9 binding posts, 8 varu im tabes, A B and C batteres, cabact and bus were as needed.

For these who wish to wind their own throng nortill, the following specifications are correct. What

couts I and B on tubing two and one half notes outside character with No. 12 double cotton covered wire. Cod A has ten turns and cod B fifty turns, and these two cods are one eighth of an inch apart. Tackler con C consists of thirty four turns of were wound on a cod form one and one half inches in diameter. It should rotate on a shaft just inside the end of cod B

at the upper end as shown in Fig. 1. With sach a tuning to it you will need one variable condenser D with a maximum capacity of ,0005 mfd.

First the grid condenser Evolent use one of the conventional type with class attached for a fixed grid leak Gwith the grid condenser Efustened to L as at the prize withing set. If you find the table goes into as I ston too suddenly, try a mualler fixed condenser at E, of 100022 midor even 10001 mid.

THE rheastats H. J. and K should be of the graphite disk or of the very compact were wound type in order to fit into the space abotted to them. Use twenty-olim rheastats for storage battery tubes, sox-olan rheastats for the one dry end type I use, and to rivolan rheastats for the one dry end type I use, and to rivolan rheastats for the tibes that resides that the time three dry cells connected in series.

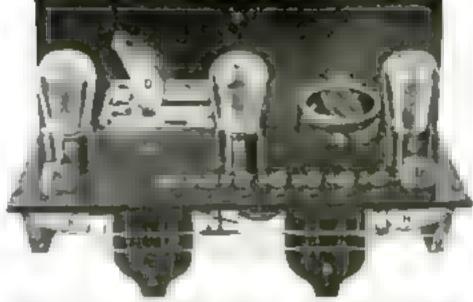


Fig. 1. Rese view of first prior winning set. Note how sockets and transformers are mounted so that the grid sommetions are extremely short

The vacuum tube sockets L, M and N in the prize set are of the new UX type. They will take any of the storage battery or dry cell tubes fitted with this base. If you prefer a socket that will take all types of tubes, there are a number available that will fit into this arrangement

Buy high-grade autho transformers for use at O and P, for on them higgely de-

Fig. 2. This pectorial wiring disgreen shows the various matruments in almost the exact positions they will occupy in the familied set

pends the quality of the music and speech from your loudspeaker

The front panel T in the prize set is one fourth melithick and the subspanel (,a of the same Unckness. You will note that the brackets I and II that has t the salepanel & to the front panel T are filled with herews fasteard rate blind holes in the back of the panel T With thes construction, the thick front panel really is necessary. These yet are handy at this sort of mecharacal wark, use the conventional three-sixteeath preh panel maternal and bore the noles for the supporting

screws clear through their use counter and flat acad machine screws with the regular brass buts at the back.

Fig. 7 shows the dimensions for beading up the brass brackets V and U. They are made out of strip brass one eighth rich by one half inch in cross-section and you will need two pieces about twenty-one and one half inches long each.

The most logical way to get started on the construction of the receiver of to cut the front panel *T* and the sub-panel *U* to the right size their head on the brackets and fit the panels together. Next construct the cubinet and fit the panel to it.

NOW you are ready to drill the panel T and the subpanel I according to the lay outs in Figs. 5 and 6. Note that only the center holes for the various motruments have been given, since the actual mounting holes vary with different makes of matruments. Next mount all of the instruments.

Before you start wiring, study the various districtions, particularly Figs, 2 and 8 the theoretical and picture wiring diagrams respectively.

The first wiring job is to connect the lower end of cod A with binding post No. 1. Then run a wire from briding post. Contained in page 1.29.

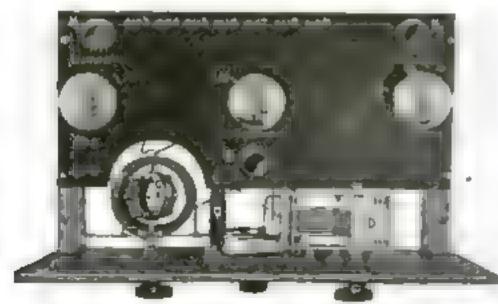


Fig. 3. The set as seen from the top. Make one before you start that the parts you expect to use will fit into this immagement Straight fine and right angle wring combine for best efficiency.

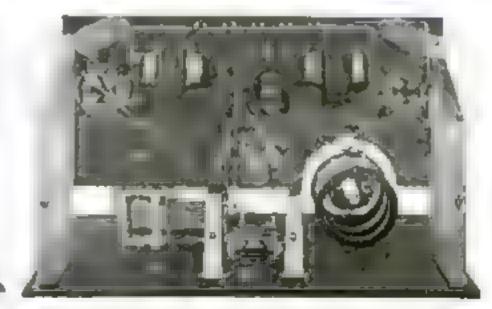


Fig. 4. The view from the hottom. Set the transformers and sockets so that all the grid connectums will be made as short as potable. Two phenomers and the adjustable grid lask are sub-panel mounted





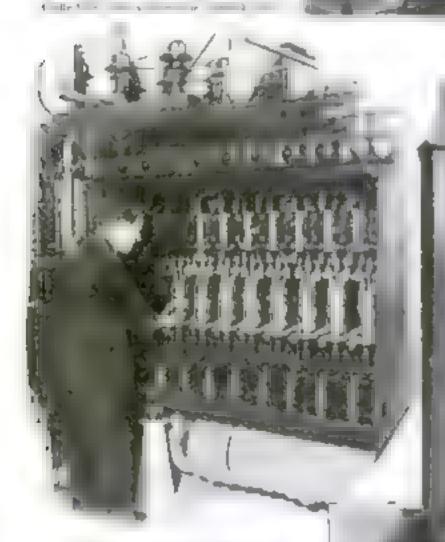


WI/ & Court Apparatus

Justice on first in warrier of person at the State of the

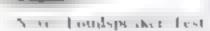


Þ	1	1	ŀ		4	7.1		н
-		H	4	ıl .		e		
						ir li		-11
r								
						h		- 48
					- 4		ul .	-104
				ĮI.	lı		* M	- 11



The lubes at Hillmorton

Here are the form that form shake page for the new East of browns or ny stall one Efficient. Where the allowed is the house of the shake the power for various of the beside a more of engineer observe. These are water for it diver the manner employed at ough powered stall acomp.



		-1.0					11
				- 1		P II	p-
	[-]			0	- II		
	- LP						
	4 .			11			
T		- 4					
						51	
			4			- 4	71
		Jr.		· 7	1		
			_				
					91		
	16		1	- 4	158		p - 1].

Dr. p. a. N. k. I. ii. the Sar and Tancing

After where we we we we have he was to the mental to the m

Hints for Novices in Radio How to Test Your B Battery

Other Helps to Better Radio Results

VDIO service men agree that at least ninety percent of the trouble cals are caused by dead batteries. Frequently it is the B battery that has become exhausted. The first radication that a B battery is nearing the end of its uses for life to a slight decrease in the volume of sound accompanied by mases that often strongly resemble static.

A voltineter is the best instrument for use in testing B batteries, but if you have no voltmeter it is a sample matter to test your batteries with the aid of a ten watt electric light bulb. Connect a piece of wire to one terminal of the buttery as shown in the illustration and hold it against the metal screw threads on the

MOLD POIL **YERTICALLY** BLOCK

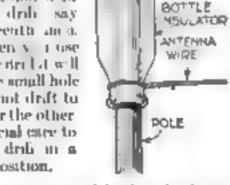
In drilling a panel, rest it on a block of hard wood to prevent bed edges around opening sule of the base while you touch the metal button on the end of the base to the other termonal of the battery

The half should hight to about half of its normal brilhancy. If it shows only a vecy dull red or entirely fails to light, you may be mire that a new battery is needed.

PHILLING the panel for a rad o receiver is simple if you me care and do not try to rush the

job. Be sure to rest the panel flat on a piece of hard wood so that the point of the drill will not break through and tear out the material around the bole.

delling large bales. it is a good idea first to drul the hore with a small drib say one andeenth an a. Then when you use the larger drill 4 will follow the amuli hole and will not drift to aneside or the other Take special care to hold the drib in a vertical position.



A bottle with a beavy IF YOU are putrary antenna for he experimental or amabrar-built sancons experimental pur-

poses, here is an ingenious way to insulate the wire from the supporting pole. Any size or shape of bottle will do, provided the mouth is sufficiently large to fit over the end of the pole and there is a fairly heavy run which will prevent the wire from slapping off the bottle. An antenna of this type is particularly good



in rainy weather, as the overhauging bottle prevents the leakage ordinarily produced by the continuous path of moisture between the autenna wire and the ground under pole.

MOST new radio fans are under the impression that a storage battery is simply a box in which electrical energy can be stored like water in a tank. And the consequence is that they treat the storage battery as they would a water tank. In other words, they use it till the tubes will not light any more, and then they recharge it or have it recharged at the neacest service statum,

This conception of the function of a storage battery is responsible for the short life of many batteries. The storage hattery is not a place where electrical energy is stored. What actually happens when you pass direct current through a storage battery is that a chemical change takes place in the material in the plates. Then when you draw current out of the battery another chemical action goes on which results in the production of an

must not misteent the battery by letting it stand in a discharged condition. When a storage battery is allowed to stand in a discharged condition another and very mjurious chemical reaction sets in and gradually renders the plates meapable of performing their proper functions. There is only one way to treat a storage hintiers, and that is to test it regularly.

electrical correct. But this chemical ac-

tion only takes place peoperly when con-

ditions are right, and that means that you

with a hydrometer, and whenever the bttle float made the syrrige ands down in the solution that you draw up in the syringe by means of the bulb at the top unts) the figure 1400 or at worst, 1150 shows even with the surface of the solution in the syringe of the hydrometer, connect up the weak battery with the charger at once.

 $\mathbf{M}_{\mathsf{intest}}^{\mathsf{tNY}}$ of the of vacuum tube sockets have both filament terminals marked F instead of F-and F+. because it does not make any difference which way the current (lowe through the fisament. What you must watch out your storage bettery wares in the bookup are connected



for, however is should be tested regu that the other lady with a hydrometer and always kept ricen and charged close to 1280

with the right filament terminal

In other words, it makes no difference which terminal you make positive or negative, so long as the wires to be connected

When filament ter marked or be same to rotatect water correctly to the ternumela you select sa positive and negative to the muca filement terminal actually are connected to the filement terminal you have decided shall be minus

Take the detector tube nocket in any radio set, for instance, if you intend to use an amplifier type of tabe in this socket as is the reginar practice today,

you will find that there is a wire from the tuning condenser that is connected with one end of the tumng coil and which is also connected to the positive figurent terminal of the socket.

To supplify your wiring, you may find it worth-while to connect the positive battery were to the terminal of the socket that is actually marked inmus instead of plus, and vice versa.

A B C's of Radio

MANY beganners puzzle over the kind of wire to use in wiring up a set. For electrical efficiency, it makes no difference whether you use insolated or plain hare wire. Nor is it necesmary to use heavy bus wire. Any wire down to size \$4 will do us well from an electrical standpoint but, of course, the bus wire is better because it is not likely to ang out of place. Remember these points, for a good Jab.

- I. Make each wire as short and direct as possible
- 2. Solder or tightly clamp every connection.
- Space all wires as much as possible, considering the arrangement of the matruments.

You Can Now "Turn on the Ice"

Electricity or Gas Operates New __ Home Refrigerators

EXTINCTION threatens the terminal And all because the threatens are the terminal transfer to the terminal transfer transfer to the terminal transfer transf mosfern science has made marvelous strides in perfecting small we making machines for the home or spartment home.

With one of these outfits, your wife need not stay in half the day wasting for the avenual. There will be no more muckly footprints over the kitchen floor, nor ice boxes smashed by stipshod handling of ree. You can go away for a week. leave the house or apartment completely locked up, and yet find your butter, eggs, and cream in perfect condition when you re-

Several typos of refrigerating plants for the average home now can be purelissed at from \$273 u.s. depending, of course, on the size of the ree best. Or, if you slrendy own a really good ice box, a refrigerating unit easily can be installed with a special tank taking the place of the untal churck of ice.

One of the important advantages of the home refrigerating plant lies in the uniformity cold temperature maintained in every part of the box regardless of outside temperature. And the clusacter of the atmosphere inside is

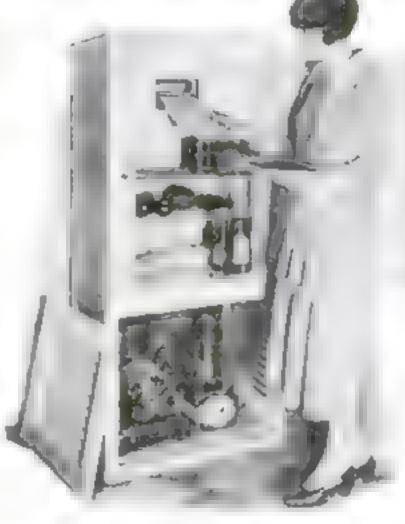
also better for the preservation of foodstuffs because of the difference in the amount of moisture in the air. As we mel a, the air usule as see box is extremely durate. With net-heral refergers. han mosture a extracted from the me and collects in the form of frost on the surface of the cooling unit that is installed

in the standard ice chamber.

ALL bome refrigeraton the same general principle. In fact, they are amply highly refined models in miniature of the huge machines used in the urbiful al section to facturing plants. electric motor drives a pump that compresses the gaseous freezing agent, either sulphur dioxide or methyl chloride. These gases, compressed and cooled to ordinary room temperatures, become liquid, and when the pressure is gradually released in the cooling unit inside the ice box, they turn into

gas again. In doing so, they absorb heat. In other words, they cool the tank in the ice chamber to below the freezing point of water.

This cycle is repeated over and over until the automatic control stops the motor when the temperature in the see



A Complete Ice Making Plant

One of the new motor-operated refrigerators for small bouses or spart ments, that provide even, dry rold for food, and clean see for beverages

> box has been reduced sufficiently. The same control mechanism starts the motor again as soon as the see box temperature nses to a predeterioused point. The apparatus is automatic and requires no attention except orling the electric motor at infrequent intervior And even this small amount of attention has been

> > camounted by a new invention of two Swedish epgineers.

works as well as ex-

Lurii on the a consumin house. hold expression if this new invention

periments seem to indicate it will. The housewife has only to turn an electric switch or light a gas flame to put it into operation. There are no moving parts. The proper amount of hydrogen, ammonia and water are in the bermetically scaled steel piping of the арумента.

The heat from the electric heating element or the gas flame in the Swedish apparatus continuously drives off annuous gas from the water in which it is absorbed in one compartment. The gaseous ammoran as liquefied by the cooring effect of water from the regular bouse supply flowing slowly through a cooling jacket. Then the ammonia turns into gas again in the cooling tank inside the leabox, where it mixes with the hydrogen gas and is drawn by gravity into another chamber where it is reabsorbed by the water. The water containing the norms on is prosped by theemosyphon action into the first tank, and the process repeats itself as long as the heat is turned on.

The cost of operation for any of the modern refragerating systerns depends, of course, on the size of year needs we on the out-

side temperature, and on the care taken to see that the doors do not remain open longer than necessary. In many parts of the country, electric power for a home refrageration plant can be obtained for five ecobs or less a a lowalt hore and when current is obtamuble at these low rates, view can keep your see box cold by means of a horse refrigerating plant for less than you would have to pay for ice,

Bill the great advantage of the apparatus is in the lack of attention required and the uniformly even cold maintained, which results in less food spoiled, together with the sat staction of knowing that you are no longer dependeat on messy tremer or any outside and possibly uncertains in dy of ice.

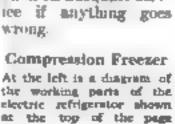
EXPANSION

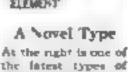
A WAF

マル ゆ

COL

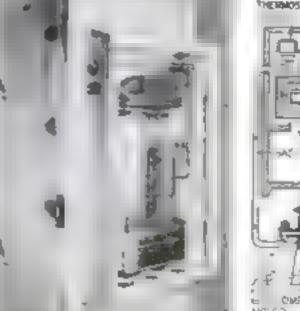
But before you place an order for either a complete new refrigerator with an ice making apparatus basit into it or simply the ice making machine to be applied to your own refrigerator, be sure that you investigate the standing of the concern number turing the outfit so that you can bank on adequate service if anything goes





the latest types of elective refrigerating plents. Its parts are hermetrally realed. end it is iiprested by gan or electricity Above is a diagram of its principal parts





Useful Additions to Your Car



Shoulder Rests Promote Comfort

Because the average road is curved from rade to side with the conter higher than the suden. the passenger on the left side of the back sent is constantly slipping over toward the right side of the cur. The strun produced by attempting to remain at the left end of the west spouls the pleasure of motoring. These new shoulder rests 'left') climinate this trouble by keeping the left hand passtugtr always in a very confortable position.



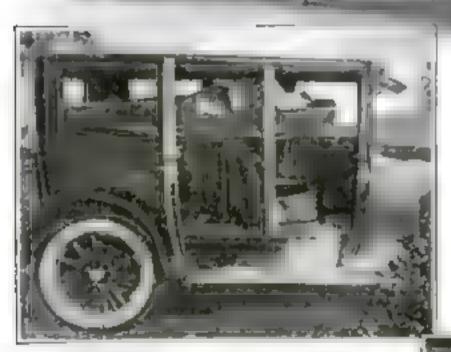
Novel Visors Cut Down Headlight Glare

This new anti-place devices commute of elliptical viscon an arranged that the light rays which normally would be thrown into the eyes of the approaching driver ore deflected instead onto the road surface on front of the car. The frame is made of metal and as fitted by removing the front lens and attaching clips



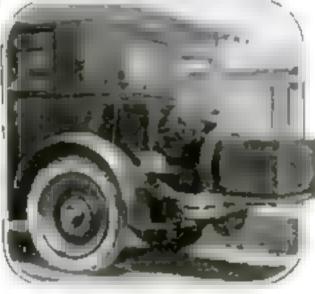
New Rim Keeps Ford Fan Working

This simple rim is boiled on over the nulley on the Ford crankshaft. The rim a said to keep the belt from shipping off. It is easily applied



Lifts Both Wheels

In order to aliminate the need for a separate jack and the difficulty of operating it against the back ask especially an English firm has brought out a pair of jacks designed to be at tacked permanently to the car. The stem of the jack is threaded and the not in general to the handle so that a very low reduction allows the car to be lifted with hetter effort (above).



Bumper and Luggage Carrier

When folded up, this device looks like the ordinary full length rear bumper, but it can be upfolded to carry extra luggage that would otherwise clutter up the tonness, and he in the way

Full-Length Bed for Auto Campers

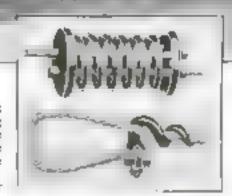
Although this bed is made entirely of metal, it is arranged so that it folds up out of the way when not in use. Singless springs are built into it. A unique feature is the method of support. A strong metal column is bolted to the floor boards back of the front west. This column takes most of the weight

Auto Notebook

Salemen, doctors, and real estate dealers will find this handy device useful for making memorands or beeping addresses where they can be referred to while the car is in motion. Two removable speaks with a strip of standard cloth are arranged within the compact case so that any portion of the cloth may be brought opposite the opening and locked in place.



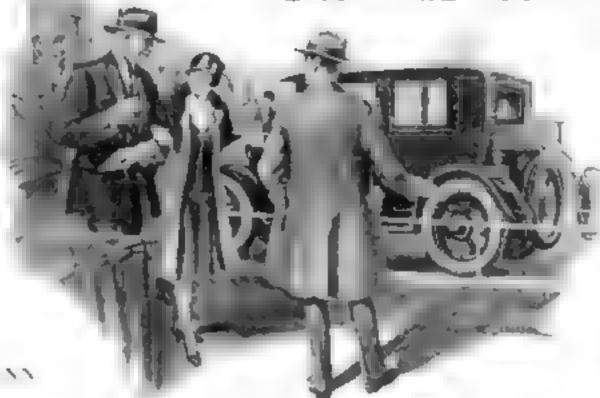
The spring buffer at the right incorporated in the tow line above prevents enapping the cubic when the tow our tukes up the slack in the line. Another feature is the peruliar shape of hook at each end of the line that permits quick attachment with out tring louds, a big item in its favor



How to Pick the BEST

Car in Its Class

Gus Stresses Importance of Simplicity and Strength of Mechanism



"ALL right, Henry." agreed Gue, "let her have the disk wheels if she thinks they're so classy. You can take the extra amount out

of her allowance."
"That's not fair"
seld Grace, pouting.
"Get your old wood
wheels if you think
they're just as good."

By MARTIN BUNN

"NOW" sand Gus Welson to his nephew. Henry, as they passed through the gate at the Milbury Auto-Show, "the first thing for you and times to decide is how much you can afford to pay for a car. Then we'll see what looks like the best buy in that class."

Henry had just been handed another raise in salary and fest that at last he could afford to yield to his bride a pleading that he buy a car. He had permaded his inicle and Joe Ciark, proprietors of the Model Garage, to help him make a selection.

"And don't forget," warned Gus, "that buying your car on time gives you no excuse for spending too much for it."

"A thousand is about the brint," said Henry, "I'm sure I can swing that much."

"That means not over nine hundred for the list price," broke in Joe Clark, "because freight, taxes, license and the rest of the incidentals will certainly run it up to the thousand mark."

"I'd like to get one of those sporty-looking randster types," sawi Heary a few maments later, as he gazed loogingly at a flashy job finished in page green with lots of nickel fittings.

"Why, Herry," clumed in his wife, "you promised me a sectan. I don't want a car that will hold only two people."

"GRACE is right, son," Gus said. "If you can have only one can the best buy an a closed model, but I direcommend a coach. You get a lot more for your money than you do in a sedan, Roadsters are all right for rich people who can afford to keep more than one car. I'll solunt that it's a lot of fun to drive a fast roadster, but it's a musance when you want to take along some of your friends.

"And," continued Gus. " if you'll take my advice, you il lay off any car that a painted in very light colors. Dust and the tar they put on the roads will make one of those pale pick babies look like the dickens in short order. Stick to a dark blue or green unless you want to spend all your spare time washing it.

"I wouldn't give a fig for all the closed cars in the world," growled Henry previously,

"Then why not compromise on a touring car?" suggested Gus with a wink at

"Humph" exchanged Henry "And have about a unified curtains to put up

every time it rails! Nothing doing! If we don't get a roadster, we might as well go the limit and get a coach."

"I m so god that's settled at any rate "observed Grace. "Can't we get one of those eight-eyhoder (longs? You know Agnes has and hought her one, and it a just too smooth for anything?"

"There's the woman of it!" grunted Gus. "Always trying to keep up with the Jones's. You couldn't possibly get an eight-eximiler car for the price Henry mentioned. You can get a good six, though."

Know Your Car

SHOCK alsorbers or rebound anothers properly applied and kept in good working order improve the riding of any automobile. The ideal shock absorber should permit free compression of the springson a bump and then the friction mechanism should take hold immediately to prevent the usual jolt. The maximum shock absorbing effect is obtained only if absorbers or simblers are designed for the car to which they are fitted or built so they can be adjusted to give proper friction.

To get the best riding comfort in driving, follow these rules.

 Get high-grade shock absorbers and see that they are correctly adjusted

 Keep your springs well inbricated and protected from mud and grit by some form of covering.

 See that your tires are pumped up to exactly the right pressure. Too much air makes the car hard ciding, too little shortens the life of the tires. "SEEMS to me a four-cylinder car would be a lot easier to repair 'lian a six," said Henry as they passed a shiny new four-cylinder model.

"You're dead right, son," stated Gus "Just fifty percent less emphatically. work when it comes to granding valves or putting in new rings or tightening up connecting rod bearings. And it as whole lot camer to locate trouble in a four-cylinder engine, too. There was a time when the four-evlinder cars were a while lot rougher running than the sixes, but what with light postons and good stiff crankshafts. the four-cylinder cars of today are pretty durn smooth. If you look at it from the standpoint of expense for repairs and the amount of work you will have to do yourself, the four-cylinder car is certainly the

"Outside of work on the motor itself, a light six won't require any more attention than a four. I hanging tires or overhauling the rear end or anything like that is the same on both. Are you going to drive the rar too. Grace⁵

"You bet I m going to drive!" said

Grace emphatically

Then don't forget, Henry, that a sixcylinder car needs less gear shifting than a four. Grace would get along better with a six on that account. Whatever car you buy, though, (Continued on page 142)

If you're tired of working for someone else = = here is your Opportunity

Be your OWN Boss

START right off in a specialized line of work that will give you steady profit, without dull seasons, without "lay-offs," and put you beyond any boss's whim. Go into EXPERT FLOOR FINISHING. Master overnight this well-paid trade, eagerly in demand everywhere today . . . because the service, it offers is advertised monthly to millions! And competition won't worry you!

Many Earn \$15 to \$20 a Day

Men no abler than you get from \$2.50 an hour up for WAX-POLISHING floors by the Johnson Electric method, for which we fully equip you. And this big-paying work is WAITING for you right where you live, NOW. Every home, club, hotel, restaurant, almost every store, should have its floors and linoleum polished regularly. You can do it perfectly, be paid apot-cash for it, and never have to go home tired—for the machine does ALL the hard work.

JOHNSON'S WAX Electric floor Polisher

This wonderful, new, swift, easily-managed machine BUR-NISHES ANY FLOOR to a beautiful, gleaming lustre. It runs itse f You merely guide it along. You need not bend nor stoop nor strain to do a perfect job. Ten times quicker than handmethods at DEEP-WAXES wood, linoleum, tile, marble and all other floor-surfaces to the finest polish imaginable.

Investment Less Than \$50

You get into this well-paid vocation for an outlay under \$50. This fits you out with the wonderful Johnson Electric Floor Polisher a Lamb's wool Mop for applying the wax and a generous supply of JOHNSON'S LIQUID WAX. You pay not one cent for the training which qualifies you as a Floor Expert. We contribute that FREE OF ALL CHARGE to you. And you are actually SET UP IN BUSINESS IMMEDIATELY, right in your own town.

Don't Delay

Act NOW

Just as a starter, send the coupon and get the details. It doesn't obligate you in the least and it may be the starting point of a big, successful, prosperous business of your own. Look into this!

	s. c. joh	City T	hin Cor	pon (P. S. S,	4 USE Racin	it VE, W	rs.
H	Please to Johnson E	III me ho	ow I can	realize:	\$110.00			
*********	NAME		1.146	18891	11 -	. ·		
	ADDRES.	5						
	CITY				STAT	re.		

Newest Aids for the Autoist

An Arm Rest for Closed Cars, and Other Useful Ideas

HILE the driver of a touring car or rougbout usually finds that the aide of the body is low enough so that he can rest has left arm comfortably along the edge of the body beside the seat, the owner of a closed car is not so fortunate, especially when the window is partly closed in cold weather. A simple arm rest can be constructed out of sheet metal and acrewed to the ade of the body at a convenient height. Figs. 1 and 2 show a typical example. The galvanised or sheet from framework is covered with upholstery fabric to match the interior trim of the car. On long drives, an arm rest of this type will add greatly to the comfort of the driver. Fairly heavy padding is desirable to promote comfort.

IN SOME makes of care, the choker rod is fitted with a spring to pull it back into position when the knob is released This construction is used to make it mipossible for the motorist to forget to throw off the choker after the motor is warmed up, but it is a nusance in very cold weather when it is necessary to hold the chaker out for some time because the motor heats up so slowly. A piece of sheet from bent up and slotted as shown in Fig. 3 will chaninate this trouble. The motorus will have to bend and shape the device to suit the construction of his own choker rod, and it will be a good idea to fix it so that it will hold the choker in approximately the position required for warming up rather than for starting. In

order to make sure that the device will always be handy when needed, get in the habit of tucking it down at the end of the seat cushion

when not in use.

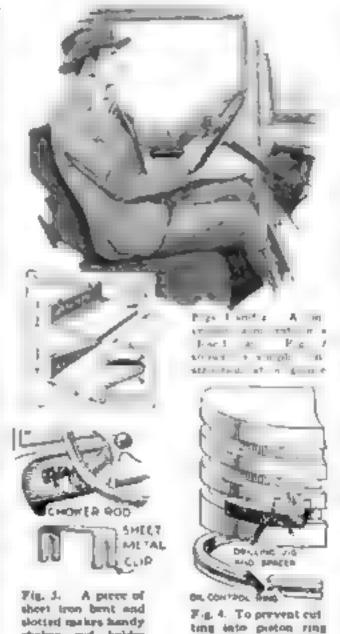
WITH many of the oil-regulating types of piston rings, it is necessary to drill holes in the puston. ring slots to allow the excess oil that is scraped off the cylinder walls to flow back into the crankease by way of hales through the pustans. Great care must be taken an drilling these holes to make sure that they are spaced properly and that the drill does not cut into the sxie of the slot and cause the gas to leak past the paston rings. A simple way to avoid these difficulties is to make a drill jig out of a piece of one of the old piston rangs. Fig. 4 shows how this

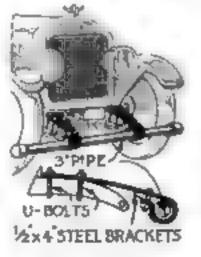
HOSE PROPERTY PROPERT

Pig. 7. A tire pump will prove merul to cleaning out bolt hales that have become filled with curbon

can be done. Drill the hole in the piece of old piston ring a trifle larger than ordinarily

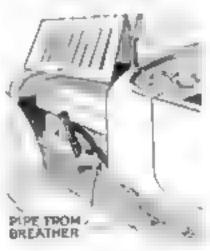
ASIMPLE way to make a satisfactory bumper for your car is shown in Fig. 5. It consists of two brackets made of heavy





cheker rud bolder

Fig. 5. A homemade bumper can be constructed from a three-inch iron pipe and pieces of beavy strap iron



elets, use a dnB jig

gain bin pe cent phen

Fig. 4. A branch from the bevolter pipe can back under the car will divert the nanual breather fumes to rear of cac

Ten Dollars for an Idea!

CHARLES S. JONES, of Philadelphia, Pa., wins the \$10 prize this month for his homemade humper, which is shown in Fig. 5.

Each month POPULAR SCIENCE MONTHLY awards \$10 in addition to regular space rates for the best idea for motorists. Other published contributions will be paid for at usual rates.

strap iron, some U-holts, and a section of three-meh iron pipe with caps acrewed on the ends. A coat of chamel can be applied to match the car or the bumper bar can be nickel plated

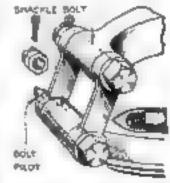
NE source of discomfort in the closed motor car that is arrieging and unhealthful is the burnt gas that gets into the body from the breather pipe by way of the nedal slots and the other openings in the floor boards and dash. Even in a nuctor that is in perfect working order, more or less of the expanding gas leaks past the juston rings into the crackcase, The breather pape in the era ikcase a lows this escaped gas to flow out of the crankcase, otherwise the accumulated pressure would cause loss of power and considerable oil leakage. One sample way to get rid of these muxious gases is to fit a Light exployer the top of the breather pape and also fit a branch pipe that or run back for chough under the body so that the gases will be discharged to the rear of the car. as shown in Fig. 6. The size of pipe is not important, although it is not a good ules, to use smaller than 14 - neli inside dameter. Copper tubing will do very macely.

UNDOUBTEDLY a large number of cylinder head botts are strepped each year simply because the hole in the cylinder block into which the bolts were acrewed filled up with carbon when the tops of the pixtons were scraped and the catra force applied in an attempt to force

the bolts up tight proved too much for the threads. It is a mighty good ides to insert the bolts loosely in the holes nearest the poston being semped, but if earbon does get into them, it can be removed very easily by screwing a tire pump hose to a space vasve stem and blowing the carbon out of the holes. The end of the valve stem that goes made the tube is made regularly with a small hole that will do needy as a nearle. The flange can be sawed off, if destred, as shown in Fig. 7. Use a pointed instrument to loosen up the earbon if it eaked hard-

LINING up the hole in the spring bushing with holes in the shackle is no simple job. Fre-

quently the threads of the shackle bolt are battered is forcing it into place. A sample remedy is a punted cap nut in place of the regular shackle bolt nut, which can be driven into place with a hammer (Fig. 8) An ordinary nut can be filed this shape.



(Fig. 8) An ordinary nut can be simplifies task of getting spring bushing and shackle holes together for the bulk



The greatest problem in the manufacture of asphalt products solved by

Tycos Instruments

Says M. S. Darrow, Manager Barber Asphalt Co., Madison Plant, Madison, Ill.

"Keeping our materials at the proper temperature—the greatest probiem in the manufacture of asphalt products—has been easy since we installed For Index and Recording Thermometers throughout our plant in 1916. We are the largest manufacturers in the world of asphalt products, especially roofing.

"In making roofing we combine several different asphalt materials at the high melting point of 350°P. Air passed through causes oxidation, and the higher the temperature and the faster the air goes through the quicker the oxidation. However, the air sets up a chemical reaction which produces additional heat and if this is nor controlled we have an explosion. In regulating the fires under our 19 converters, we rely upon 19 Tayror thermometers

The four saturating ranks in which rooting felt is impregnated with asphalt from the converters, must be kept at a temperature of \$60-400°F. A Boot recording thermometer on such gives us an accurate check and record. The saturating tanks are heated to the proper temperature by circulating heated oil around them On each of three absorbers we have double registering good recording both out going and incoming temperatures.

"Four flue gas thermometers show whether we are operating at an ethoseor temperacure. The proper temperature for our boiler feed water is indicated by a Taylor Some 30 Other Taylors are used as testing thermomerers, in laboratones, etc.

"We have used other makes of thermometers, but none are as sansfactory as On our converters we can go to within 5° of the flash point and feel safe with Bene-

TO MANUFACTURERS

If your manufacturing processes require the indicating, recording or control-Ling of Temperature, there is a type and style of instruments in the 500 Line of 8000 varieties that will help you. Informative literature on any type of instrument will be sent you promptly on request, or our engineer will consult with you on the application of Bost to your perticular manufacturing problem.

Taylor Instrument Companies

ROCHESTER, N. Y.

Canadian Plants | San SUILDING, TORONTO SHORT & MASON, Ltd., Manufacturing Distributors in Greet Britana.

Tycos for Home

Your Office Thermometers An aid in promoting human efficiency

Som Bath Thermometers

To enable you to get the most good from

See Wall Thermameter

To help you to mainten a temperature in your bouse conductive to good health

Tree Quality Companies

To show you the right way to unfame mr country.

Suit Hygrometer

To eachir you to keep the humidity of the et morphise on your home correct at all nines.

Front Mount Set

Sake Oven Thermometer Condy Thermometer Sugar Meter. The secret of accurate results in WELL BLE

1900 Fever Thermometers

A necessary in every home

Hear Stormoguide

Forecasts the weather ewenty-four hours ahead with dependable accuracy.

Tour dealer will show them to you. Ask us, on a pastal, for bookless on any of the above



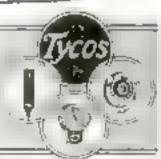
for the Medical Profession

Sphyrmomanometer Pocker & Office types Fever Thermomesers, Litinalpus Glassware

Wolferin and Thomas

THE SIXTH SENSE OF INDUSTRY

Temperature Instruments





We Home Workshop

A Rotating Harrow Lightens the Work of Gardening

FOR garden patches where the space does not permit the operation of borsedrawn implements, the leveling and smoothing of the ground in preparing a seed hed usually has to be done with a garden rake -a slow and technica job. A practical tool for performing this work may be made from an old auto or track casing, four ponorbi of 30-penny spikes, a

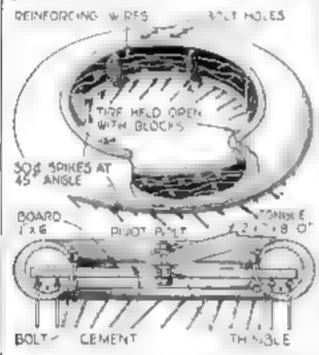


holt, some rement and said, and two meres of 1 moer

The age of the easing to use depends on the strength of the operator or the power that may be available One 30 by 314 in. will thake a one-man took.

Hold the casing open with sticks or blocks and deive the 30-permy unkerthrough as shown at about a so-sleg. angle staggered 4 in apart. Vilow the heads of the spikes to remain by in above the more surface of the cusing. Bond the hearls with a few pieces of wire to serve as respforcement for the cement.

Before pouring the cement into the enoug, faster a 1 by 6 in board across with four bolts, as indented. Mix one part of cement and three parts coarse



Large spikes are driven through an old sette casing, which is then filled with encourers

sand or gravel and pour into the casuig. All a the conject to set for several days.

A 1-m unfer them is borest through the board at the center of the cassing. a thimble cut from a 34-10, pipe, I in king, is provided; and the tongue or pulling arm 2 by 2 m. by 8 ft is per ited in place (Continued on page 85) with a Agric.

Andels Suilders Carden are fully Mustrated—easy to read and understand. Each set is a Good Trade Course for the apprentice—and a Good Palarmen for journeyman and master. Use coupus below for tree maniseles.

Audels Carpenters and Builders Guides—4 vols. \$6 🤾

by compared the product of a general Bu is a Journa Bu in a Marchania 1990 perpet.

1770 Harrana; the little, packet also. So it out in rections now metal de ideas so a now de a system of the many paying production. An easy progressive course for the appropriate. A mandatud by before and Quark Reference for the many worker. A seeing libral to East, and Settler Work and Better Pay. To get this aid for yourself since pay 6 to and mad the FREE COLPON below.

INSIDE TRADE INFORMATION ON: Vests of The Trade - How to Use The Steel Square - Lew Filling - Jointory How to Make Furniture Corporters and Builders Arithmetic - How to Read and Draw Flam Specifications. How to Figure John House and Roof Framing How to Lay Out Work Foundations Doors and Windows States Millwark How to Faint - and hundreds of other subjects.

and hundreds of other subjects, covering the entire trade with pictures and explanations all easy to read and understand. Andel: Conferences and Hussilers Lin. of dee full trial erecy

who is no the busine, no reade. He can learn more J. A. Monning, Lockport, N. V. Rest Para World

udels Plumbers and Steamfitters Guides—4 vols. \$

new set hest set & grades at Ministrated, Refer else Leb any and Squity origine for Ministration and Leb and Leb and Leb and His print Shop Ministration of States and Burners and Burners and Burners and Leb ward of the care w our PREE tought below to again the without

INSIDETRADE INFORMATION ON:

Plansberg Code Physics Meterials and Tools of The Trade Load Work Water Supply Drainage Rough Work How to make Tools How to Figure Jobs Pipe Fitting and in Banding Heating Vertitalian Refrigeration Cos.

Steam Shout Metal Work Smithing Brazing Meters, and hundreds of other subjects covering the plansbing trade. Each point clearly explained in first and pictures that you can easily sinderstond.

Audela Guides are practical case to understand, and an beceived upon. They cover the entire field in W. F. Arminger, Annapolis, Md. FIN H 12 HA BOSE

Audels Masons and Builders Guldes—4 vols. \$6

new complete illustrated and exercise blurgey for Bankungers frement Works at Plaste s a la Setters and Stone 2007 Character Bushing packet aims. A practical Trade Assumption on ma of the construction Easy to The Setter's area Stores or stand apply A remains and authorize deleterine with the Fifth Education of the want find out for years without outlies on whether the set was become your INSIDE TRADE INFORMATION ON: Beich Work Haw to Loy Strick Various Bonds and Dougne Strick Franchistons decided the in Set Tile Made in Figure John Construct Work Maining Haw to Plants patient Retro factor Work States How to Plants on Different South Manders Man to Waster on Different South Manders Man to Waster on Different South States Manders Daniel on the Building of States and Barriers to States of Manders of States and States and Barriers to States of States of States and States of Sta

Audels Handy Book of Electricity-I Complete in one

Audels Hamly Book of Practical Electronty Himteriol, is a Mean't Reference and Study to order to one person over leafue bound book. Energy engineer the what, the balls and so obes on, find on this up to date these the KEY is a practice, an decisioning of Electronic 2000 angues 2000 dispresses. A pale of authority and Helper wasy butch attend

INSIDE TRADE INFORMATION:

The entire electrical field is covered in this one volume. Here are

tone of the chapter headings.
Wiring Diagrams Calculations Machine Shetches Malgatering Diagrams Calculations Machine Shetches Malgatering Diagrams and Repole Malara Armeture Winding Power Storage Exterior A. C. Meters and Wiring D. C. Malara log Talephone Telegraph Ignition Company with and Wirks loady Reference Index which gives a mick answer to every or dem

To Earn More-Learn More

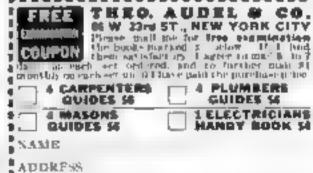
He a GOUD methanic It's more esting fying it insures you against unem-playment Learn all about your trade by easy reading of these Builders Guides.

handy and feether

OUR GUARANTEE

Examine any beek published by an without clurys. If you like it, heep it. It not, send it back. Pay us unly if you are satisfied. He charge if you are not.

THEO, AUDEL & CO. 65 W. 23rd St., NEW YORK, N. Y.



EMPLOYED BY

COCCUPATION **6T34**

I Wanted a Hand Planing Machine

So I Made One. It Has Easy Running Ball Bearings, and It Cost Me Very Little to Build

By RAY I. KUNS.

Principal Automotive Trades School, Cincinnats, O.



complex cam be ab-

Materials for this

tames couly. The ball bearings Are from a junited suro. Note the cutter head and the ad pasting ways for the forward table to the view below

ARIS jointer or hand planer, as it is often called, was first designed for one in a home workshop. It was so ellieunt that a second one was

constructed on the same plan for use in a

achool shop.

Wale it is not designed to carry a beavy, continuous load, each of these time hier is reasonably accurate and on occasion will surface the face of a 10-m board. The same general plan might be followed for a machine for lighter service. To run out a machine for beavy service, the bend would have to be made more substantial and the aree of the motor. BicTowed.

In most cities a half-horsepower electric motor is about as large as is permissible on the regular lighting errent. That as the size used to this instance. The speed of the head as held to about \$500

revolutions a minute. A 2-m. belt in used to drave the jointer The motor is mounted directly on the machine and the adpartment on the glied belt is made by slading the motor down or slots provided for that purpose in the board used for mounting the motor

Equal-leg angle troops, 14 by 3 m., are used for the legs and for the top of the frame supporting the head and the The braces E are nude from of by ton, angle

The frames made up from the parts J. M and E are first put together. If the shop is equipped to do welding, the corners are webled.

The legs K next are worked to size and riveted to the two frames. Welding could be resorted to instead of riveting for thu work, but the danger of the parts being warped out of square is considerable.

Plates made from short lengths of the 2-m, angle from are riveted into the lower comers of the legs to make feet, and they serve as anchors for fastening the machine to

the floor. One-half meh holes are drilled for the lag acress or bolts before fastening these feet in place.

Particular cure abould be used to see that the top of the frame is fairly level. otherwise trouble will be experienced in fitting the tables and head to it

With the frame in good condition, the work on the tables and the head may proceed. It will be noted that a good part of the bend frame and table sup-

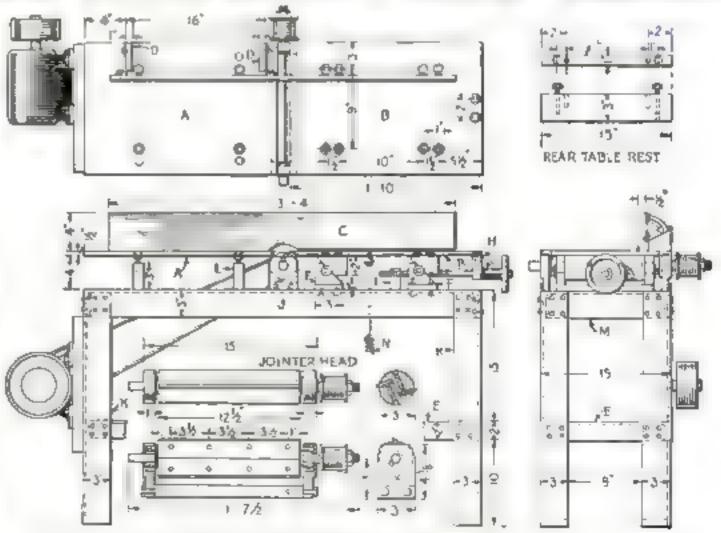
parts is made from 1 by 8-in, cold rolled steel. The rear table rests L are two 15-10 lengths of this material Cap screws fasten them to the frame.

hasmuch as the rear table does not require a great deal of adjusting, the plan of allowing the table to rest on for r capt services was adopted. These screwt may be turned to any necessary height then the table is last a place and clumped securely by tack is of the other cap screwa arranged to come just 1 in mone cach of the first four or which the table is restring. All cap screws used to faster the tot les are gent and laive the tops of the heads dressed off trild tary are pested in countersunk hules

The cear table could be adjusted more conveniently if it were provided with shiring ways as is the front. That is

optional with the budder

The front table must be provided with easy means of adjusting the depth of the cut. To avoid complications, blocks of rold rolled but are out as a dicated at F. The cut is at 43 degrees. In order to prevent the ways that are screwed to the forward table from shipping off their companion ways bolted to the frame, a cup screw and washer arrangement is used. Each of the four lower ways is dedled and tapped as near to the 45 degree व्यक्तित स्थापन अस्त Continued on page (64)



Top, front and end views of the junter and details of the rest table rest and the cutter head. The cutters are made from strips of tool steel. The same general design can be followed for a lighter machine

Own a Typewriter!



A Bargain You Can't Ignore!

GFT YOUR typewriter goes. A gradue Scottan World to make l a rwood is the one you what "tap beygwiech tida, buy "Every me tier to it, now anyone can at ed it Don't send a tr t - but do got our big special st r our valuable book on typewriters and typewriting

You can learn to write on this standardkey loard made are in one day. A week safer the expressions has brong that, you differ lost without it. A trial will prove it-and doesn't cost you a penny!

A New Plan

Our rebuilt plan gives you the best muchine and saves you a lot of money.

The Underwood is so famous a make, and No. 6 so popular a model, you'll have to speak up if you want one of the lot we are just completing nowl-

We rebuild from top to bottom; replace svery single soom part; each machine is in sporking condition. New typewriters are commonly guaranteed for a year; we guarantee these completely rebuilt Underwoods five years: That's our Better-Than-New Guaranteel And we guarantee a big saving in to oney!

We don't ask for a cent now. Nor any money at all, unless you are completely won

by the wonderful writing machine we ship you for an unrestricted 10day free trial. When you do buy, take advantage of our very liberal scale of monthly payments. A host of our patrons have paid for their typewriters out of money

made typing work for othera (One woman made @ thousand dollars at home last year with her Underwood.)

If you know typewriters, you know the periect work and the ease and speed of an Underwood. If you This is a Genuine UNDERWOOD

The ace of All Writing Machines:

have never owned a typewriter, start with the finest! One that will last you all your life! But, the time to act is NOW. Don't miss out on this present bargain offer. Don't do longer without the convenience of a typewriter.

Free Trial Offer

Our plan gives you the opportunity of a thor-

ough trial before you buy. You run norisk whatever. You start to pay for your typewriter after you have found it the one and only machine for you! But get the facts before this lot of machines is all in use. Clip the information coupon before you turn the page. It will pay you! Note the very useful book you will receive free! Write for full particulars at once.

Get our cutalog that tells how we rebuild these wonderied Underwood typewriters in the jurgest factory of fts kind in the world, and lowest praces and terms in existence. We will also include free, the new Type Writing Manual - it gives many exemples and sam-per of uses for your typewriter, in business accounts,

eccial correspondence, recipes, stopping lists, household accounts, etc., school work, literary work, etc.

Underw



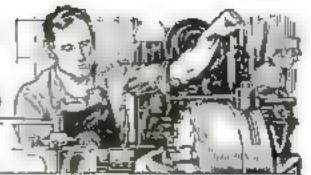
Mail to Shirman Water Mrs Contract

Pleasesend me full offer with Type Writing Man-nai FREE proces, terms, etc., and full information about your FREE course to Touch Type with ing. All without obligation; this is NUT an order

Numb.			
5t or R. F. D	_	-	

Better Shop Methods

How Expert Mechanics Save Jime and Labor



Old Bill Repairs a Machine Bed

How to Draw Broken Parts Together with Red-Hot Keys

LD BILL, standing in front of the shop watching the traffic go by, thought the day, with the first real marks of spring in the air, was glore our. It was wonderful to have a moment of leisure to look at the people driving by,

and to see the first sprouts of green on a tree down the struct.

Even so energetic a man as Old Bill seems to feel a certain launtude in the apring monshase, and he revoled in the thought that he had nothing in particular to do qui such a del gutful morrang.

"You are wanted on the phone," came a call from inside a pan to burst his bubble of revery. He went into the office.

"Thus is he," he said into the transmitter "Yes, I can rome right away."

The same that passed with the summons was back, or, rather, another smale took its place. Before, he had been good just to be hying now he was happy because he was ngam in his element. He

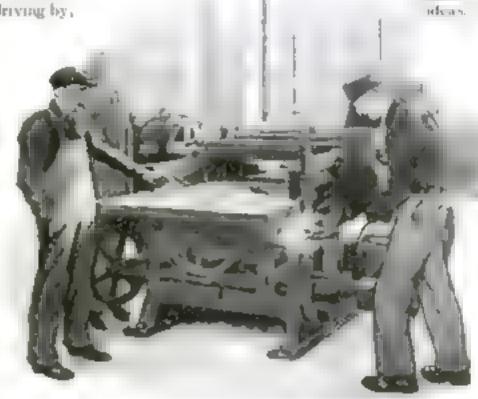
straightened the shoulders that had carried so many burdens straightened them to receive another; and, once more the efficient man of machinery. he walked briskly through the shop before getting his flivver for a short trip to a furniture factory on the edge of the town.

Modern industry demands machinery that will perform superhuman tasks. To thus end designers and inventors have gathered machine elements together into a compact and complicated mass that they call an automatic machine. Almost human, an automatic machine! With many tools hogging, sparling, ripping and boring their way into the work at the same time! Moving parts that start, carry and stop with the delicacy and precision of human fingers! Gigantic frames that stand firm as granite!

TWAS such a machine Old Bill had been called to doctor. A 20-ft, length of line shaft had been dropped on it and had cracked the bed

To Old Bill's eye, the gathering around the machine had the semblance of a family gazing at the rum of a bome destroyed by fire. The whole factory force, with the possible exception of the fireman, was standing around the emplied machine. The accident had stopped production

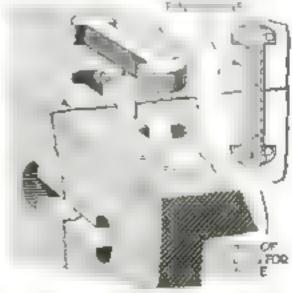
By JAMES ELLIS Machine Shop Superintendent



Old Bill supervised the placing of the heated steel keys, which pulled the two parts of the cracked table firmly together as the keys cooled and shrunk

ent rely for, as is often the case, the one may hone played a part in everything that went through the plant.

These things did not thery long in Old Bill's mind. He was studying the damage. A big overhanging section of the frame had been broken off. The casting was about an inch thick and formed a sort of extension of the main hed of the machine, and carried two spindles. The operators had taken off everything removable.



An electric & II and chapping chisels were used in preparing the T-slots for the hey-

"Could you weld at " the president of the company asked.

Old Bill slowly shook his head. He appeared not to bear several other ques-He was ransacking his mind for steas. First he looked at the top of the

break, and at the bottom, then stood off at I hoked at the aidea. Finally be said. "Get it eleaned up, and I will be back in a little while?

"What are you going to do, and how long will it take"

For it- and by tamerow morning 'Old Bill replied, and granned,

THE head of the firm better of it in a snow him head doubtfully us Our Bill Jurried out of the talk it

The rule of the consumer seemed test creases in vessel to Old Bill as he drove the flaver to the shop. Only long training to driving enabled bun to dodge the cars that darted in front. This mind was on something plac-

In the slop Less aght Boh Laten first and told I un to

gather up some tools. Then he went to the blacksmith shop and drew a little aketch.

"Leave some stock so that we can machine these keys to fit," be said, and lutried off to find Laten with the fools in a bag and an electric drill beade it.

At the plant, Old Bill and Bob Lates began to lay off some holes. The apprentice whom they had brought along connected the drill. In a few minutes chips were flying.

Old Bill's method of repairing the break was apparent to the factors superintendent, who stood beside the president.

"He is going to cut lee slots in the edges of the broken casting. Te said, and then slownk keys in to hold the partitogether. The same way that the flywheel on our englise is made.

Wul it be strong? ' the president

Just about as strong as paything else could be, 'Old Bul said as Le stoon back and watched the work. "It is the best thing to do in Continued on page 1 18

MANY time-saving shop ideas are contained in the continuation of the Better Shop Methods Department, which you will find on pages 102 to 112,



Floor, Bench and

Cabinet, Scraper No. 181

Use this and save your skin

"See that universal joint in the head of the scraper? It certainly beats tying rags on a flock of sore knuckles."

A turn of the handle locks the blade of a Starrett Scraper at any desired angle. It's about the handlest tool for tight corners you ever picked up. Has eight sharp edges—any of 'em can be put into action in an instant—a comfortable hand rest and a hardwood ball and handle. If you've been using an ordinary scraper ask your dealer to show you a Starrett—and you'll see the difference.

Write us for free copy of catalog No. 23 "W"

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksons Unescaling
Steel Tapes — Standard for Accoracy
ATHOL, MASS.

Use Starrett Tools



"Be sure you send us STAR HACKSAW BLADES

Weknow what they'lldo"

The shop foreman will never buy any other back saw blade when he can save great waste from breakage by the use of Star Special Flexible Blades.

Star blades have been recognized for their superior qualities for a great many years, and this new blade is the supreme achievement of the oldest hack saw makers.

WRITE FOR FREE SAMPLE BLADES

Clemson Bros., Inc. Middletown, N. Y.

MAKERS SINCE 1883

STAR HACK SAWS



Tie Home Workshop

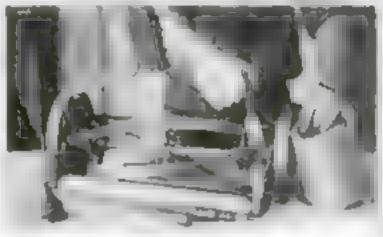
We Overhaul Our Lawnmower and Make It Cut Like New

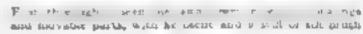
By LAWRENCE B. ROBBINS

A SMOOTH RUNNING clean cutting the handle widdles on ta tremains, lawrenower gives sest to training. Well, let's give it a real overhanking



















Me Mome Workshop

We Overhaul Our Lawnmower

Transferred from page 78

end, and should turn just freely enough to revolve without any play. To take up any looseness, turn up or down the two setserows found at each end of the cylinder, or loosen the single setscrew and turn up the cone with a pail, according to the type of hearing

Then liv means of adjusting screws, set the stationary blade at the bottom so that it just touches the revolving blades all along their length not tightly enough to hand, but enough to exase alight frection as they pass by It is good practice to lower this bar before testing and adjusting the cyunder bearings, but in any case, st should be raised now to meet the revolvang blades.

Turning on a short shaft on the disk behind each drive wheel is a small gear

called lite partors

Back of the proton as a small but of steel called a pawl. This engages the blades when the mower is pushed,



The points of the sevolving blades, if too long, should be filed down on a slight bevel

Pull off the pimons and clean the pawla. If they are badly worn, either buy new ones or make them from a piece of tool steel, hardening them afterward Then put back the pinions, after oiling the pawls thoroughly. Smear the gear teeth and pinion shafts with petrolatum.

A good method of home sharpening is to reverse the pinions, side for side, so that the bades wal run backward, and replace the wheels. Max fine eachorundian powder with machine oil, work into a smooth paste, spread evenly over the stationary blade, and then push the macline apside down along the floor

Keep pushing forward and backward until the blades will spin when the maen ne is brought to rest, Test for sharpness by meering bits of paper between the stationary and revolving blades. If they are not ent clean when the blades are revolved, repeat the process with more earborandam compound and adjust the atationary blade closer to the cylinder, if necessary. A file can be used for beveling the extreme end of each blasse where the points are apt to be left too high.

Clean off all granding compound, replace the pinions in their proper order, and reassemble. All exposed movable parts should be oiled thoroughly; the remaining surfaces should be wiped with bensine or gasoline and painted

An occasional oding will, of course, belp to keep the mower running quietly.

Men are quitting

by the millions—old-type shaving preparations for this unique creation. Accept, please, a 10-day tube to try



GENTLEMEN: Five years ago Palmolive Shaving Cream was unknown. Today it is leader in its

It is a unique creation. It differs immeasurably from any shaving soap you have ever tried. Eighty per cent of its users once were wedded to rival makes of shaving

It is based on the four requirements 1000 men named as their ideals of a shaving cream, plus a fifth . . . strong bubbles , . . which we ourselves added

We think you will like it. Sixty years of soap study stand behind it The same careful study that made Palmolive Soap the leading toilet soap of the world.

May we ask you, then, the courtesy of trying it, both in your interest and in ours?

These & Advantages

- 1-Multiplies itself in lather 250 times
- 2—Softens the beard in one minute
- 3-Maintains ats creamy fullness for 10 minutes on the face.
- 4-Strong bubbles hold the hairs erect for cutting
- 5-Fine after-effects due to palm and olive oil content

We think we have done a great job. You may agree, or you may not. But in fairness to us both, please give it a fair trial. Send the coupon. Do this today

THE PALMOLIVE COMPANY (Del. Corp.) CHICAGO ILLINOIS SHAVES end a con of Palmolive After Stavens Take

A one-pipe smoker finds his tobacco

The problem of keeping an only pipe sweet, cool, and soothing has been solved by a Long is and habordasher

On the chance that a number of pipe smoking readers of this magazine may be in the same predicament that Mr. Lilenfekt found himself two years ago, we publish his letter for what it is worth

Richmand Hill, L. !

Laten & Ren Co. It chimand, Yu. **Lightlenich**

Distributed I cannot re-appete with the principles who is the principle peacetapy of 65 pixes of all always forms on makes. I am the on per of one peer sulftany star. This pipe I have carried many long years. At times it has been a good put, positing one with starced, mellow amoke, but at other three food how it could bits! I was at a seen to nevertain the feared bits. Present time I changed the legand. and why Every time I changed the heard I would magte that I had discovered a new find but when another new tin was

how that but when another new the wan bought it was pover the same. Nonehow or other I say neroes Edge-worth I believe it was becombineded one at semic caper edge. Since I was always ready to take a court at anything I be ught purpo. What a relief was the first pipeful? The old figure pure became scutting again. Sero sate & was a final. I thought to take add "Wall I hast." Strange or otherwise is had been I have be a stocked Laster with for the past 2 years an believe me which for the past 2 years and believe one automate will have to step some to make me as trh

LIBER LIVER S Z. Latenfeld.

Let us send you free aumples of Edgeworth so that you may put it to the pape test. If you like the mmples, you'll like Estpee eth wherever and whenever you buy it, for it never changes in EDGEWORTH quality.

Write your name and address to Larundt Brother Company, 10 Q. 8. 21st Street, Richmond, Va.

We'll be grateful for the name

and address of your tobacco dealer, too, if you care to ask! them

DGEWOATH

Edgeworth is sold in various sizes to suit the needs and means of all purchasers Both Edgeworth Plug Siee and Edgeworth Ready-Rubbed are packed in small, pocketsue packages, in handsome hispardors holding a pound, and also in several handy inhetween maen.

To Retoil Tobacco Merchania: If your lobbar cannot supply you with Edgeworth, Larus & Brother Company will gladly send you prepaid by pureel post a one- or twodozen earton of any size of Edgeworth Plug Slice or Edgeworth Ready-Rubbed for the same price you would pay the jobber.

On pour radio—hore in in WRVA Aschmend, Vo. the Edgeworth station. Were length 460 meters.

goriskinow smoli w

Remodeling a Mantelshelf

A Simple Way to Modernize an Old-Fashioned Fireplace

RESENT-DAY moder in freplace design favor the projection of the hamney into the room. It should rise stroight up from the front and sides to the ceiling, or slope from the sides, or incline from the front and sides as well. If you have one of the old-style mantels in

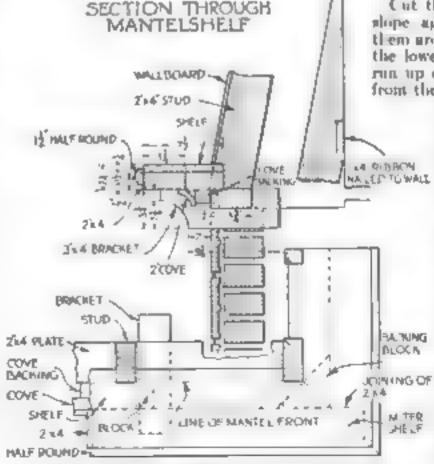
your living- or duning-room with a flat-topped mantelshelf, you can remodel it easily to conform to one of the other designs, and in that way bring the room more in harmony with the modern trend in interior decoration.

For the design films. trated, carefully remove the shelf by prying off the moldings with a clusel and lafting the shelf apward.

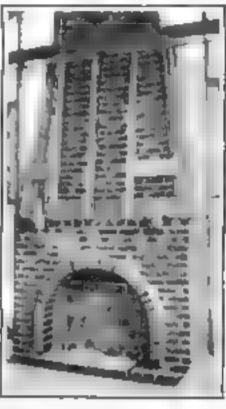
Make two brackets of 3 by 4 m. stock let in, long, and cut on the front edge of each a cove with a radius of 24 in. Cut a notch in the upper edge 4% in, back from the front end to receive a 2 by 4 in. plate, as shown in the sectional drawing.

Locate the positions of the brackets near each end, my 13 in to the inner faces, and with a small chinel chip out the face tile or brick to receive the brackets. Start near the center and chip very carefully to a yord eracking the tile or loosening it. The

backing brick can be attacked more boldly. Nail the plate to the brackets and place the latter in the notches in the brickwork.



The upper view shows a section through the shelf and upper framework. The lower detail is a plan of the shelf corner



Interior decorations favor fireplaces built so so to give a lofty appearance

Return the plate to the wall at each end by butting short pieces against the front plate, and secure the ends by nailing them to a strip naded on the wall. This groundwork should be well leveled and thish with the faces of the fireplace.

Plumb up on the wall to the meture mold from each cod of the fireplace, and measure in at the top for a slope equal to the slope of the front.

About 16 in, below the mold nail a 1 by 4 in. ribbon horizontally across the studs, enough the slope lines, and had I by 6 in, backing strips between the ends and the mantel plates.

Cut three front study to fit the slope against the wall, notching them around the ribbon and fitting the lower ends to the plates, and run up comer studs to shipe both from the front and ends. Tack up

> and test for almement with a straightedge, and after any necessary afteractors, nail up solidly.

Where the light brackels are la come, cut p eces of 1 by 6 in boards between the outer studs. keeping them flush with the outside. Born accurately placed koles through which to bring in the wiring, which may be estended through loom from the wizing of the old brackets, or, in the absence of these, wires can be tapped from the ceiling and brought down made the built-out flue. The frame should now resembie that ia photograph,

(Continued on page 6)

When you and spring are thrilling to the first ball game of the year—and your favorite player drives out a homer—when the stands rise, roaring with cheers—have a Camel!



Camels contain the very choicest tobaccus grown in all the world. Camels are blended by the world's most expert blenders. Nothing is too good for Camels. In the making of this one brand we concentrate the tobacco knowledge and skill of the largest organization of tobaccu experts in the world. No other eigenetic made is like Camels. They are the overwhelming choice of experienced smokers.

WHEN spring's first ball game is here. And a heavy lutter cracks the ball, shrieking into center-field for a home run—oh, happy mortal, as the stands roar with give—have a Came!

For Camel adds the magic of its own fragrance to life's most festive days. Camela are of such choice tobaccos that they never tire the taste. Camela are so skilfully made that they never leave a cigaretty after-taste. Spend what you may—you'll get more pleasure out of Camela than any other cigarette you ever put a match to.

So this fair speing day as the bases fill and a hefty batter lofts out one that it seems will never stop flying —oh, then, taste the smoke that means completed enchantment. Know then the mellowest flavor that ever came from a cigarette.





Our highest trish, if you do not yet brown Camel quality, a that you try them. We serve you to compare Lamely with any other enguerate made at any price.

R. J. Reyunide Tobacca Company

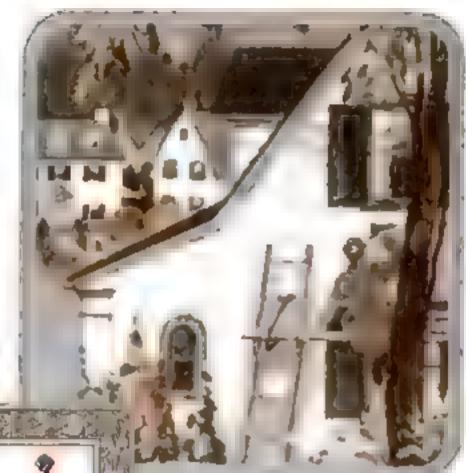
If you like "Popular Science"

you will like this

Here is a practical service for practical home decorators: Sher-win-Williams, who originated the now famous Household Painting Guide which gives authoritative information on correct finishes, have added a color service. You can now skilfully select a harmonious color treatment for anything, from a piece of furniture to a whole house. This, in effect, brings to any work you may do the full abilities of the experts in the Sherwin-Williams Decorative Studios.

These refer recommendations are reproduced in beautiful pictures and, like the Household Painting Guide, may be seen at "Paint Headquarters," the live paint store in your community. Look for this store—you will recognize it by the sign.

For a beautiful and valuable Sherwin-Williams brochure on home decorating send the coupon printed below. Write the Sherwin-Williams Company, Dept. E, 639 Canal Road, Cleverland, Ohio.



HOUSEHOLD PAINTING GUIDE TO VAILNISH TO PAINT TO STAIN SURFACE THE PROPERTY DAMED BELOW AUTOMOBILES A.W. Asso Broad 3-W Auto Dresset Clea S. W. Augus Engineer S-W Anim Top and S-W Auto Pens Dressing JWP House Paint S-W - september West Plants BRACK. No David Sauce CEILINGS, stories 6 % Hambroth Man. Fig. Loon Street North Springs SWE Brown Zut-1 the (betch Rose) CHARGINATE 5-W Formerie Wall Plant OKIKIRIL Interven SWE Brown Paint SWE House Paint S. W. and Depart Old Perch Renault PENCES FLOCIBIL Interes p. W James Plant Panel P.W. Crarle Place Place. Mar-Ret Variant 5-W Country Plots Fis. 86. Freevole 3-W Con-rese Plant Plainh 5- W Pers hand Owek Parel PURSUITE NA. reter Sept Mill Squad 146 Parch Engaget Engage level HOUSE of CARACIL KWP Neur Part Chi Durch Bound all big of the 5-9 Inside Floret Parel Mar Net Yarres 5. W. Lewis Poor Po FIGT- Come It W. Stumbroom on Galet RADIATIONS B. W. Marel and Mriego Parel SAME RELIEF S-W Servers Zorome b to be desired Kapmel \$1.178 S.W. Family Point Brajur Yurrah Flut Turn-SWF H-use Paint by Dates Entered P WENTHER WEST IN For removing panel and carried one Tarists

SHERWIN-



Beautiful and Preserved

SWP is the highest-quality house point. It is possible to manufacture. If quality pays any where it is in house point. It could as much for labor, with short-lived point, as with SWP, which goes farther, covers better, holds its color and wears so much longer that it pays thinly times over "There is no substitute for quality."



FREE

BEAUTIFUL COLOR IDEAS

Send this Coupon

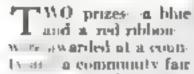
Give us your name and address and receive, retirely free a very special or brocker for knows of branches bomes. Lovely interiors and exteriors in colors. Samples of many popular shades—each a correct Sherwin Williams product, as specified us the Homebood Pain on Guste Send the couput loday, to the Sherwin Williams Co., Dept. E, a59 Canal Road, Cleveland, Ohio.

NAME		}
ADDRES		?
bresence	THE THE THE THE THE THE THE	anomenta)

Chief Britis Co.

D. 1204 -

Miniature Kitchen Cabinet



ed of yellow pine with wall-



hosed panels It was given one coat of flat white and a thin coat of winte furniture ename).

The ornamental design and untals were drawn outside the guass doors with a pencil-idaped piece of taundry roup and then painted on the maide with gold enamel. Roy C Braam Ry

Remodeling a Mantelshelf

of a world from page Mills

For the shelf, use 1 by 6 in stock, wellsurfaced. Miter the corners butt the returns at the ends against the wall by scening there to the praster and notch around the false study to give a projection of 12 and beyond the bracket ends

Flush with the face edge on the under side had a 4 by 4 in piece surfaced four sides. Mater the corners for 1, 10 and shows er the rest of the joint, as shown in the plan view

Glor this jor it to the nuter of the shelf and further remoterce the noter joint by groung and mading moster at a tenangular "seab." as moreated So treated, the miter in the shelf should open very little through shrankage

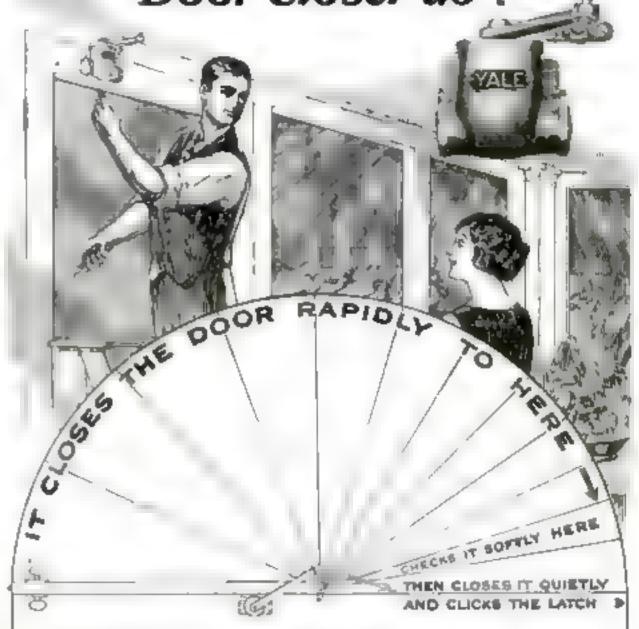
To support the rear edge of the shelf null a block against each stud, bearing on the plate and against the 2 by 4 in piece. on the under side of the shelf. Between the brackets and a 114 by 112 n. step. flat against the unifer edges of the blocks and against the plate, and miter a 2 m. cove around under the shelf with this steep as a backing. Mitter a 112-in. halfround molding to the shelf edge, showing a margin of 🛂 in, above

Cover the false studs with wallboard. carefully fitting the east pieces against the wall and natering the corners. Decorate to match the room, and put up the light ing fixtures.

If it is desired to run the face of the flue plumb from the mantel face, nail suitable cleats to the ceiling against which to secure the upper ends of the studs.

Where the fireplace itself is boxed in and the removal of the shelf would be likely to damage the woodwork, the upper frame may be erected above the old shelf without further alterations, or a wider abelf can be built over the old .-EDWIN M. LOVE.

Just what does a TALE Door Closer do ?



The Yale Door Closer is a door-closing power plant, perfect in action; made with the precision of a smooth-running engine; every part co-ordinated to the quiet closing of a door.

As the door is opened the power of a highly tempered steel spring is stored up waiting for release. As the hand leaves the knob the spring unwinds, promptly starting the closing action, and at the right moment, controlled by a piston working within its cylinder against hydraulic pressure, the door gradually loses momentum and comes to a quiet stop as the latchbolt clicks in the jamb.

Put Yale Door Closers on those Screen Doors this summer. No more nousy annoyance from slamming screen doors. No more half-shutting of the door, with flies entering in spite of the screen.

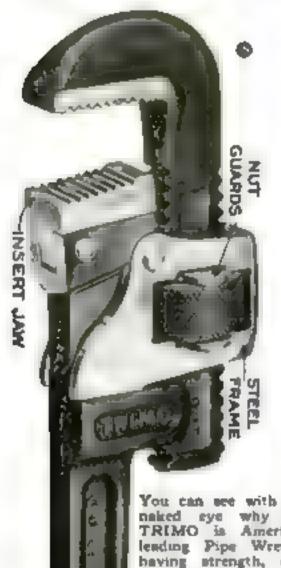
The Yale & Towne Mfg. Co., Stamford, Conn., U.S.A. Comadian Branch at St. Catharines, Out.

YALE MARKED IS VALE MADE



TRIMO

America's Leading Pipe Wrench-Why?



You can see with the naked eye why the TRIMO is America s leading Pipe Wrench. having strength, durability, economy convenience built into tts whole make-up, Good tools are the cheapest in the long run.

Three features make the TRIMO America's leading Pipe Wrench (1) INSERT JAW in the handle, replaceable when WORM (1) NUT GUARDS that keep the wrench adjusted in close quarters and (3) STEEL FRAME that will NOT break. Eight steel hundle sizes from 5 to 48 ms. Four wood handle sizes: 6, 6, 10 and 14 ins.

THE TRIMO Monkey Wrench

Is simple, strong and all drop forged; has only four parts. Fully gueranteed, needed by every mechanic. Ask your dealer for these TRIMO TOOLS - accept no other

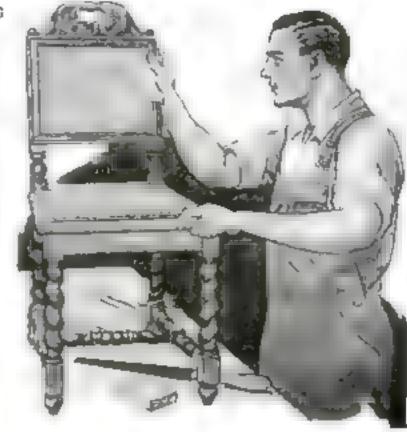
TRIMONT MFG. CO. Rechury, Mass.

Me Home Workshop

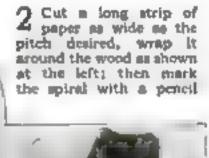
Wood Turning without a Lathe

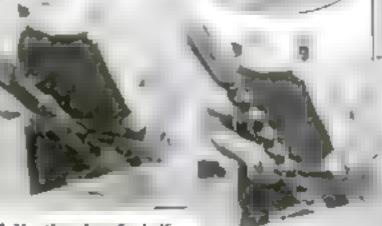
By RUFUS E. DEERING

WOLLD you believe that you can make graceful, spirally turned legs for homemade furniture with the commonest of hand tools. and do it more easily than you could shape amost any of the much commoner types of posts? Most beginners in woodwork would say it is unpossible, yet the process is really simple. The steps in shaping the spirals, which can be made any size destred are shown below



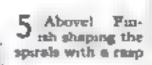
Shape the part round with drawlande, pocket knafe, or a wood rasp. It need not be amouth but should be round

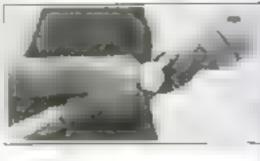




3 Carefully saw a 1/4the length of the spiral

4 Use the edge of a balf round wood rusp to deepen and widen the narrow groove previously made with a hand saw





6 Smooth very carefully with sandpaper wrapped around file or stick

8 (At left) Work out knobs, balls, octagous and other shapes with wood resps and coarse bastard files, fimaling with sandpaper

Hold a piece of anndpaper in the palm of one hand and rotate the work to finish smoothing the continuous sparal surfaces

Mr Home Workshop

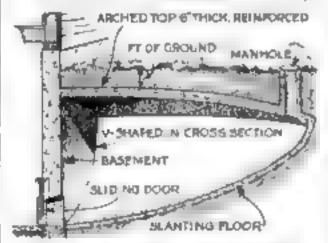
How I Improved My Cellar by Making a Coal Vault

By ELGENE L. GIESE

TO KEEP costs down, the builders of I many homes pan for small bosements. In my home, this defect was remedied by hunting a coal bin outside the foundation wad. Besides affording more room, it allows the basement to be kept cleaner and to be put to more uses.

The concrete has holds say tons and has manhole conveniently located for filing. The bottom shads rather steeply toward the coal opening in the basement.

The forms for the concrete are placed in the exercation somewhat in the shape



An excavation is made outside the cellar and a conceets your or bin is constructed.

of a V, so that the top of the bar is noticeably wider than the bottom. This fact takes the feering of the coul to the rong opening in the cellar. The top of the him is a fnot or more below the ground so that it will not interfere with planting

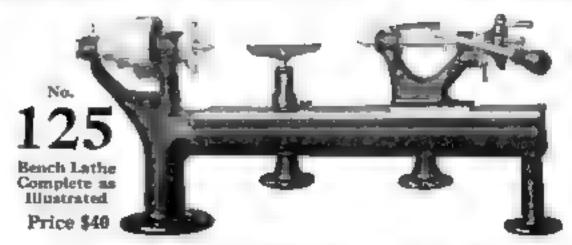
Not up il after the concrete wasls have get for several days are the forms for the roof of the bis placed in position. The top in in the shape of a flat arch and is made of concrete at least 0 in, thek with reinforcing so that the roof will support a reasonable weight. The writer used steal lath for reinforcing the roof.

A sliding coul door in the basement was found to be the most autofactory The frame was made from 8 by 8 in. material, grouved to hold a stout door.

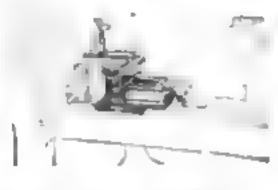
Have You a Good ldea?

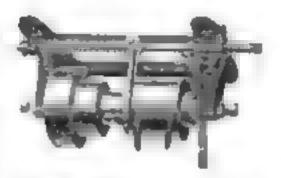
IN CONNECTION with William Braper Branckies a armets, "How to Utilize Your Cellar," published but month, we asked readers who have worked out good ways of using their cellars to send letters describing their ideas to the Editor. Payment will be made for letters mitable for reproduction

The suggestion in the above arturb is of special timeliness, as many householders ran out of coal during the strike last winter and suffered great expense and inconvenience simply because their coul bins scere too meall to hold a winter's supply.



This bench lathe makes your home shop a real workshop





Counter Shaft

THERE are many turning and boring jobs you could do yourself if you had a bench lathe, Make your workshop more complete by adding to it this Goodell-Pratt Lathe. It enables you to do professionallooking work. Over-all length of this bench lathe is 25 inches, height, 1116 inches, swing, 7 inches; extreme distance between centers, 12 inches. It weight only 30 pounds.

This lette has a milled bed and a fail stock with milled base. Live spindle has a cone bearing to take up wear. The tail stock has both screw and lever feed. Cone pulley has 3 steps -1 2, 2' 9, 31's suches in diameter. The lather is finalted with black and red enamel All working parts are beautifully polished.

A complete line of attachments is available to fit this lathe. Among them are a slide rest, lathe tools, compression check and collete, milling Attachmenta, turret attachmenta.

Bench Lathe No. 494

This lethe has the same construction as the No. 125 above, but is slightly larger. Length over all, 31 inches; height, 11's inches; swing, 7 inches; extreme distance between centers, 16 inches. Net weight, 36 pounds, price

400-page Book of Tools FREE

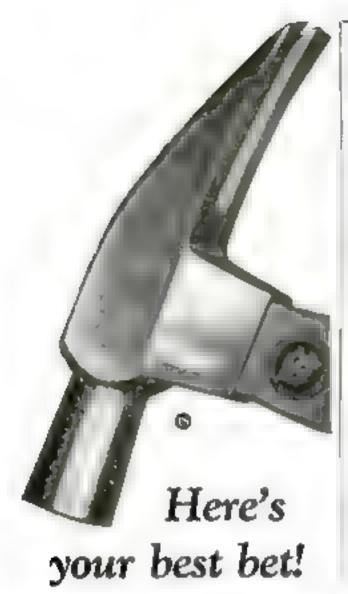
A postcard will bring you the 400-page pocket-size book of all the famous 1500 Goodell-Pratt tools. In this book are shown and described many tools you will want to outfit your workshops completely. Every tool shown is beautifully made and finished by skilled toolmakers. Just let us know where to send your copy of the book. It is FREE.

> GOODELL-PRATT COMPANY GREENFIELD, MASS., U. S. A.

Makers of Mr. Punch

GOODELL-PRATT

1500 GOOD TOOLS



Chency hammers

When you pick a Chency you pick a winner.

It's a hammer that will stand a lot of wear and tear—even abuse. It's a hammer that will be right on the job long after most other hammers have been put in the junk pile.

The first time you use a Chency you'll be tickled with the "hang" and the "Never-Slip" grip, and you'll recognize the real value of heads whose ends are tempered differently-each according to the work it is to do-, of wax-finished second growth hickory handles, and a system of wedging that keeps the head tight.

That's why for 90 years men have been asking for the Chency Hammer. They've wanted the hammer made of the stuff that stand the gaff. And there's a real guarantee that it will stand the gaff-even stand abuse-back of every Cheney Hammer.



How to Make a Rabbeted Joint

By EMANUEL E. ERICSON, Noted Manual Training Authority

AMATEUR mechanics who nail and serew together their woodwork without any pretexase at joinery are musung half the fun of woodworking. To make a workmanhke joint gives real delight. This and similar articles to come will show you the secrets of cabinetmaking.

You will find many uses for rabbeted joints in making furniture, and, indeed, in all sorts of woodwork. Drawer fronts, for instance, are often rabbeted to take the aids preces, instead of being dovernised. Sometimes this is called an end-lep joint.

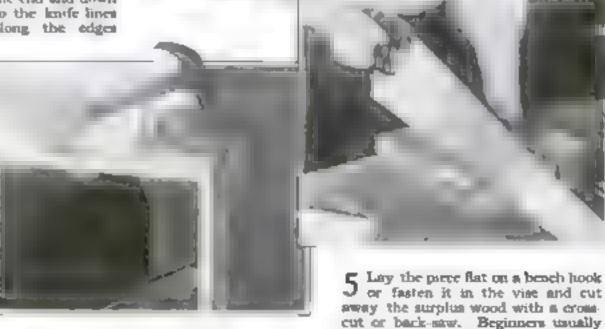
After face-marking the pieces, place one member on the other and even at the end and edges, and make a mark in the inner corper as shown at left. Both pieces, it might be well to remind the ameteur, should have carefully squared ends



Remove the vertical member and place the lenfe in the mark previously made. Then move a try-square against the knife and draw a line across the surface. Continue the line halfway down each edge. On rough work a pencil is used. matered of a lensfe, but it is easier to work accurately to a knufe line

3 'Above' Set a marking gage for whatever amount of end grain to to remain visible in the enbbeted mem ber this may be one had the thickness, but usually taless. Gage along the end and down to the knyfe lines along the edges

(At left) Place the piece in a vise and cut down on the gage lines with a ripsaw, beginning the cut on the nearer corner. As you precred with the cutting, bring the new level



Glue the joint and fasten with plenty of finishing nails of acress, at the same time testing for squareness

or fasten it in the vise and cut away the surplus wood with a cross-cut or back-saw. Beginners usually find it best, and it is always safest, to cut a V groove with a knife or church before making a saw cut of this hind

Wirkshop

Easy Way to Make Small Cupboard Doors

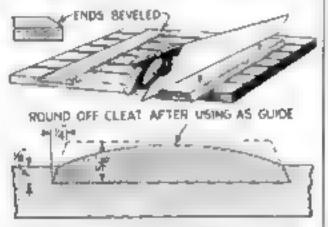
By DONALD A. PRICE

SMALL cupboard doors with dovelail battens running the full width can be made quite easily. For instance, if a door 22 by 26 in is required, but the tangueand groove material approximately the right size. Nail it down lightly on the weekbench or any other flat working

The size of the cross cleats, in this case. 3 % in. wide at the wider end should be determined, and they should be given a taper of 14 m. to the foot, or, in this mstance, made 214 in. at the narrow cud. They should be about 2 in longer than the linished width of the door. Both edges should be beveled as shown by the

dotted bues.

Nail the finished cleans temporarily on the goor on their proper center lines so



The clean are tacked temporarily on the door us a guide in making the devetell new cuts

that they will serve as templets for cuting the grooves. The soul end should be placed a short distance aside the edge of the door, as destrated to allow for the thickness of the saw kerfs. This distance wal vory from 1 to 2 m., according to the lasekness of the saw

The saw can be grided by holding it tightly against the bevelest edges of the cleat. Make the saw cuts 3; in deep on both sides, remove the creat and rold the groove to a depth of Jam over all Them. round the top of the cleat, coat the groove with gite, and drive the cleat in as far as it will go. Cut off the ends and bevel them to give a neat horsh.

It is necessary, of course, to attach the langes to the cleats. Variations of this method can be used for other work such as making a shop drawing-hoard that will stay flat, in which case, however, glue the cleats only at the center to allow the board to expand and contract,

A Rotating Harrow

(Continued from price ...)

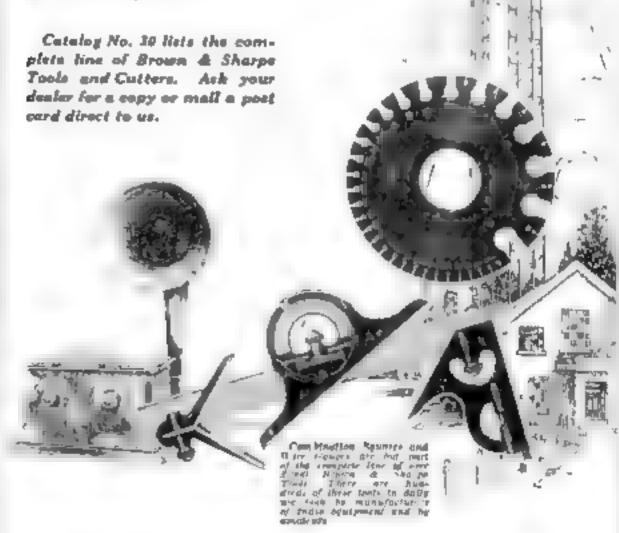
holt. Do not overlook the two washers that prevent the cramping of the parts

A handle, made from a piece of broomstack, extends about 16 m, on each side of the torgre-

As the harrow is pulled along, the spaces at one side stick into the ground while those on the other side slide over the surface, causing the harrow to revolve, thus breaking up and leveling the clods. -George G. McVicker.

Jhe World at your door by the turn of a dialbecause of Good Tools/

When you hear the sweet, clear music from a concert over a thousand miles away you do not, perhaps. think of the tools which have brought about this marvel. Wire, tubes, storage batteries, motors, generators, and microphones must be made accurately. In their manufacture, you would find hundreds of Brown & Sharpe wire gauges, screw pitch gauges, micrometers and many other tools for the accurate measurement of thousands of small parts.—You'll find Brown & Sharpe Tools on all jobs where tools of the highest quality are required.

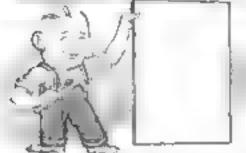


Brown & Sharpe TOOLS

BROWN & SHARPE MFG. CO.

6

Providence, R. L. U. S. A.



Do you need eater roome? Do you went to sustain extra partitions. Shake your attic.



Upon Board on just one cracked or falling culing, Light to weight casy to apply Cannut crack. You'll agree there's nothing better



Is your house hard to heat? You can our your fuel bill 20% to 38%—add meeded rooms at the same time—by liming your rooms at the same time-actic with Upson Board.



Laboratory tests prove Upont Board 25% to 200, stronger ban ord nary sheathings Birengthens imulator enhances invest-

You are sure to have at feast one use for Upset Board about your home. Why not try too us one coming? You like a Send try ton an one county? You like + Send 10c for samples and full-size detail blue print specifying the desired. Address The Upson Company, 527 Upson Pt., Lockport, New York.

-WRITE FOR SAMPLES=

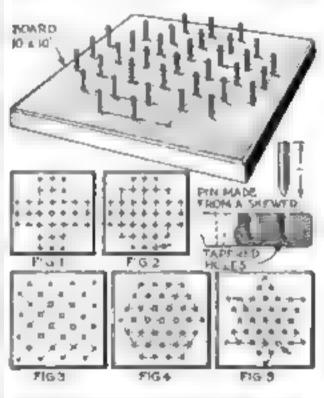
Mome Workshop

Five Curious Puzzle Boards

By ARTHOR L. SMITH

"HE OLD game of solitaire will furtish a great fund of amusement for all members of the family in reward for a few hours, work in making the board. It opens up a wide field for those of an inventive maid, who may delight in devising new forms of the game. Those of a mathematical turn of mind will find pleasure in discovering the underlying law that governs the position of the court ers, making a solution either possible or unpessable.

Boards may be made of any suitable material and embellished to soft the taste. of the constructor. The amplest was as to draw on a board about 10 m, square any



Unusual variations of standard solitaire game boards. Figs. 2, 1. are shown in Figs. 3, 4 and 5.

one of the designs, litistrated, or an origiautone

Holes are drilled or panelsed at all the intersections. They are best if tapered. and the writer has used a center punch in making them, after grawling it to the taper desired. There is little danger of splitting the board if care is taken.

To make the pegs, a bundful of wooden skewers may be obtained from a butcher A point is ground on the end of one with a peacel sharpener and the peg cut off to the proper length, about 1 in. A sof-Report immorer of pegs can be made by this method as a short time.

After the pegs are inserted, the problem consists of jumping them out, as in the game of checkers. A true solution is reach ed when all the pegs are taken but the tast which should had in the central hole a henever the design permits at:

If preferred, counters or checkers may be used instead of pegs, and round or or rare spots painted on the board in place of holes.

Figs 1 and 2 are the standard games of solitaire mentioned in dictionaries and encyclopedias. Fig. 3 is an old checker puzzle adapted to the peg board. Figs. 4 and 5 are designs to show how new games may be devised

In Figs. 1, 2 and 5, pega are put into all the holes and the player has the choice of removing any one in order that the j itupang process may begin. In Fig. 1, a true solution is possible if the central peg is removed. In Fig. 9 it is doubtful. though it is left as an open question for the reader to decide.

Solutions are given that leave pegastanding in all the circumferential boles while the last one lands in the center, but this does not seem to be bonk fide. If a corner peg (indicated in the drawing by a circle) is removed, the pega can be jumped out, but the last one will be most contrary about landing in the center.

In Fig. 5, the case is similar to that of Fig. 2. The pegs may be jumped out if the peg indicated in the drawing by a circle is removed instead of the central one.

Twenty-four pega are employed in Fig. 3. They occupy the two outer rows, while eight holes are left vacant in the center of the board. As it stands, a solution in probably impossible, but it becomes possible if, at the beginning of the game, one peg may be removed, or if one prg may be added in one of the two central holes, or if one of the inner pegs but on the boes connecting the double corners may be inseved one space in

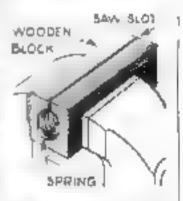
The player who tries to work the puzzle. as it stands usually becomes confused after intense mental effort and unconarmusty inserts or removes a peg and is del goted when all are jumped.

In Fig. 4. a similar design is offered to which seven miner holes are left vacant. I frue solution can be effected here, and you will be delighted to see the last man land obligingly in the center.

The third article in this series by one of the foremost authorities on puzzles will appear in an early issue.

A Quick Way to Make Rings

RECENTLY devised the wooden method adustrated BLOCK for ranking a minuber of wire rings ort of a closely coded spring. After horing a hije slightly larger than the coiled spring through a block of wood, I made a



saw cut to serve as a guide for a harksaw and then placed the block and spring in the vise. Cutting through one side of the spring resulted in a series of rings, each of which could be closed and flattened with a few taps of a hammer.-W. J. E.

Ms Home Werkshop

Easiest Way to Wire Lamp

By GEORGE A. WILLOUGHBY

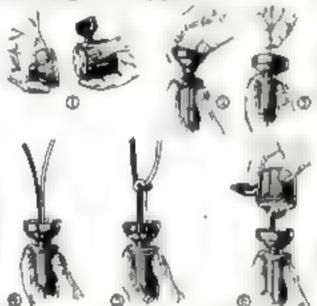
Supervisor of Electric Work, Arthur Hill Trade School, Saginaus, Mich

FROM the shelf above his cellar work-bench, Fred Andrews, one of my neighbors, lifted carefulty a pair of silver and blue candlesticks.

"What do you think of them?" beasked Before I could tell him how much I liked them, he went on You know I found them knocking around the attic. They must have belonged to my grandmother All I did was to wash off the dust and soot of forty years, give them a coat of gesso, and polychrome them. What I want you to tell me, though, is how to wire them for electric light

"That's easy, I said, "but you'll need a hole all the way through for the wore. "That was the first thing I did.' Fred

and "bored a hole all the way through " "Then you will need two short pieces of one eighth meh pipe each threaded at



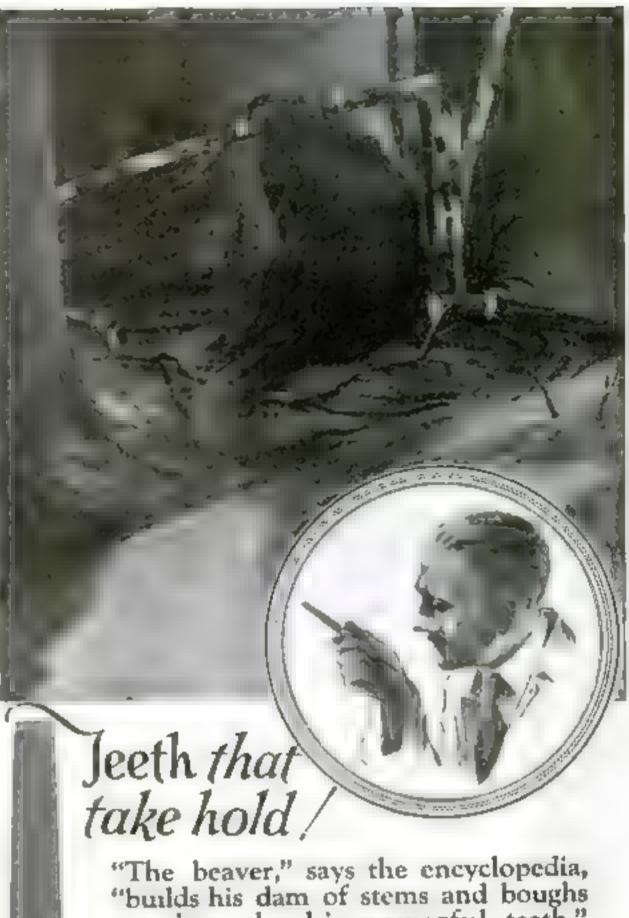
How to perform the six simple operations persistry in wring a single electric stelly

one endt two sockets, and some silk lamp cord. All you have to do is to enlarge the hole in the top of the candlestick—the same method, by the way, will do for any kind of small lamp you happen. to be wiring so that the short length of gas pipe can be pushed firmly into it. Now then, take the socket apart by pressing the shell at the point marked 'press.' Screw the cap of the socket onto the small pipe, and push the cord through the candiestick, pipe, and cap. If it is too night a fit, push a stiff wire through first and draw the cord after it.

"Next, split the cord carefully, without removing the rubber covering, tie an Underwriters' knot in it, scrape the insulation from the very ends, attach the wires to the socket terminals, and assemble the socket in place.

Fred thought this was an easy way of doing it, as, indeed, it is. Frames for bed lamps, in particular, often are sold with a small piece of pipe in place, so that it is necessary only to cover the frame with suitable cloth and connect up the socket.

It is essential not to omit tying the Underwriters' knot. Mr. Willoughby told how on page 188 of March issue



cut down by his powerful teeth."

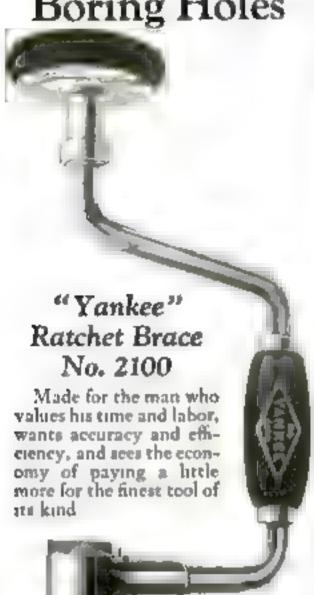
Beaver-like in their ability to take hold and finish their job are the teeth of NICHOLSON Files. Whether made for rough machine work, the home repair shop, or the super-fine filing of the jewelry craftsmen, these teeth are cut just right to meet the particular need

They are tested again and again-rigidly-before they are sent to work.

NICHOLSON FILE CO. Providence, R. L., U. S. A.

a File for Every Purpose

Whets your Appetite for **Boring Holes**



The charm which this wonderful ") anker Katcher drace has for mechanics count in-demand It has a ident per with tens of action to which they have not been ACC STUDIES

Fir No 2100 s made and timshed like a pre-"Yankee" Ratcher works like the stem-wind of a watch

And the new "Yankee ' Chuck to the most efficient ever made. Ball bearing. quick centering, and accurate. She into or any shape bit (round, square, any taper and the bit is held in a vise-like grip. The ettack releases but at a time of we've

Handler are hard rubber and indestructs

Figished headt fally to keeping with its perfect mechanism.

Some Other "Yankee" Tools

Hand Drille Ratchet Screw-deivers Push Braces

W// CODE Beach Orilla Antumatic Puch Drifts Vises, Removable Base Dealers Everywhere Setl "Yankee" Toots

' France' on the loud you buy means the ulmost in quality, efficiency, and durability

Write for FRFE "Yankee" Tool Book. NORTH BROK, MFG. Co., Philadelphia, U. S. A.

CONTENTOW SINDIES

You Can Make This Galleon

away the sides of the hull pieces B until they fit the templets at the six construction lines II to VII. Hold the two pieces together and see that they match. If you deviate from the actual section lines, it is of no particular importance; the main thing is to see that pieces B are approxmately alike,

Glue and lightly mail pieces B to the center piece, so that the construction lines on all three correspond.

To Eguten the model it is desirable but not at all necessary, to accop out a lot of the inside trood, leaving at least 36 in. at the edges.

Bore the nine 36-in, holes for the cannon about 14 in, below the edge, so that the guns will point slightly up, and forward and aft at the ends. (See Fig. 1.)

Obtain, if possible a piece of actit, three ply wood (airplane or waterproof stock), which can be had from some veneer dealers in 2-ft, square pieces. Otherwise

use heavy cardboard, several thicknesses of thin cardboard glued together, or, better still, glue together five thicknesses of this wood veneer with casein (waterproof) glue.

Take a piece 514 in, wide and 18 in. long and cut it approximately to the shape of the main deck D, Fig. 2. Thus, as well as two of the other decks, will need a slot at the ends to fit around the center piece, which makes the whole right. Ofthe and had the main deck as place after noting the suggestions given later on in regard to fastening the bitts), and trum the edges to agree with the side

Cut two bulwarks from the same material to the shape shown at C. Fig. 2, and in them cut the M in, square gun ports and the 14-m, round haves hele. Bevel the forward edge so that it fits anugly against the center piece. Leave 34 ln. extra length at (Continued on page 00)

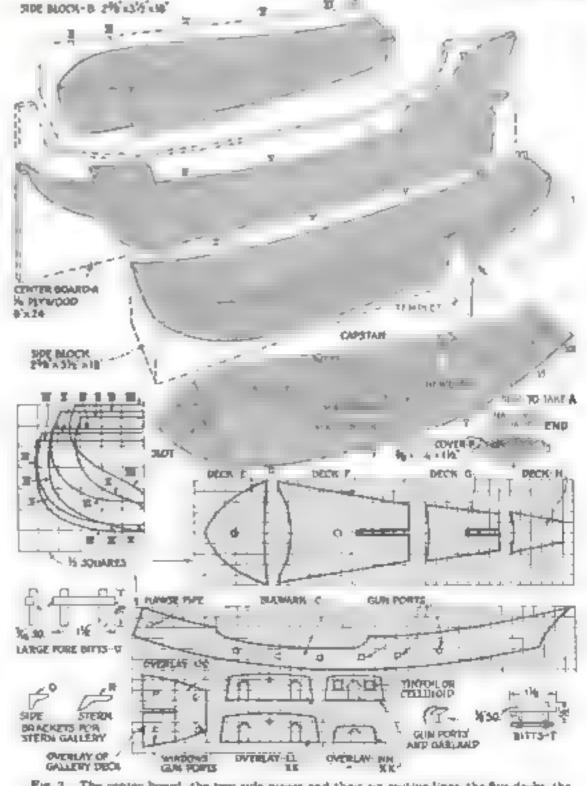


Fig. 7. The center board, the two side pieces and their six section lines, the five decirs, the bulwarks and bulkbeads, the batch gallery brackets, betts, and gun ports are shown above

Wirkshop

Blueprints to Help You Build the Galleon on Our Cover

So MAGNIFICENT in line and color is the Spanish galleon ship model on our cover, that many readers may be inclined to say. "I never could make any thing as intricate as that." But this is not at all true.

Anyone who can wick a pocket-knde and paintbroad can make this particular model. It has been designed with that idea in mind a model beginners can make, yet one the most experienced model maker would recognize as nathentic

It is necessary, of course, to have large, clear drawings, and these you can obtain ready-made by senting for blueprints. Not, 46 and 47 in the list below. Not, 46 is for use in connection with the first half of Captain McCann's article, which appears in this issue (page 71), and Not, 47 supplements both the first half and the second half, which will be published next month. It will save time if you send for both blueprints at once.

Complete List of Blueprints

ANY ONE of the blueprints lated below can be obtained from Portian Science Mountain for 35 cents. The Editor will be glad to answer any specific questions relative to tools, material, or equipment. Blueprint Service Dept.

Popular Science Monthly

250 Fourth Avenue, New York

GRATILICATES

Send me the blueprint, or blueprints, I have underlined below for which I inclose cents

ADJUST # 200 DOG		CUCA
No. Tille	Published	Price
9. Arbor Cate and Beets 10. Porch fiving 11 Bench and T it Table 12. Electric Washer 13. Tea Wagon 14. Christman Toys 15. Workshop Bench 16. Inland Racho Cathaet 17. Cedar Christ 18. Plone Table and Stool 19. O andfather v Clock 20. Plat Top Desk 21. Colonial Drak 22. Cabinet and Desk 23. Pergus Garage 24. Cateleg Table 25. Cance Bailing Outfit 26. Haby a Crib and Pen 27. X chris-Cabinet Table 28. Pullman Play Table 19. Toy Tra Cart, vt. 30. Tool Cathaet etc. 31. Sew ag Cabinets 12. Chinese Game Table 33. Dinting Acrive 34. Garden Trell ses 35. Simple Radio Cabinet 36. Rush Bottom Cheir 37. S applied Bookcase 38. Sheratm Table 39. Salem Christ 40. Desk in Sheraton Style 41. One Tube Radio Set	Feb. 22 Mor. 27 Apr. 11 July. 12 Aug. 12 Rept. 23 Oct. 12 Nov. 23 June. 23 Apr. 23 June. 13 Oct. 24 Feb. 14 Moy. 23 June. 14 Apr. 24 Feb. 14 Moy. 13 Dec. 23 June. 14 Apr. 24 Feb. 14 Moy. 15 June. 15 Ju	25c



REMINGTON TYPEWRITER CO. 374 Broadway New York

body " Address Department 67.

Branches Everywhere

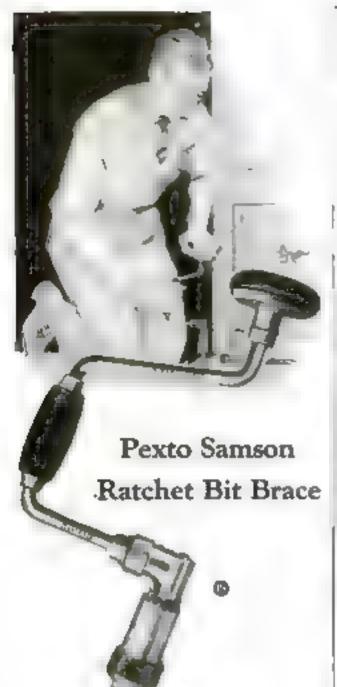
Remington Typewriter Co. of Canada, Ltd. 65 King Street West, Toronso

Remington TYPEWRITERS A MACHINE POR RYERY PURPOSE

Rentington made Paragon Ribbont and Red Seal Carbon Papers always make good impressions



Children and State



OR the mechanic and for general home use, the Pexto Samson Ratchet Bit Brace, illustrated above, will give a lifetime of dependable service and stand up under the severest 'roughing.' Its ballbearing chuck gives the Pexto Brace a grip that never lets go. It will hold round, square or taper-shank drills. The Samson is the kind for you-it's a boon to the "home mechanic."

PEXTO TOOLS are carried by practically all progressive dealers.

The Peck, Stow & Wilcox Co. Southington, Conn., U.S.A.



The Home Workshop)

You Can Make This Galleon

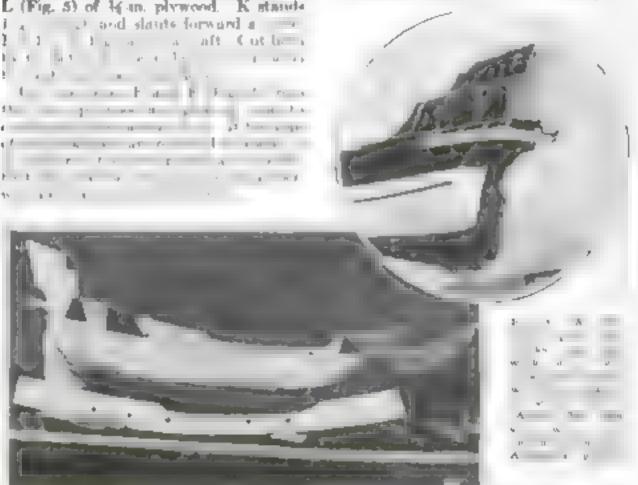
the after end, to be transped when yo Incompanies

Steam the forward 6 in, of these pieces (unless cardboard is used) and glue and nail them to the hull, overlapping it 14 in. A rough block of scrap wood glued in

the stern (Fig. 3) is helpful for nathing into. Note how this bulwark follows the ti mble-home" or mward slope the hull On the deck erect the bulkbends k and L (Fig. 5) of 16 in. plywood. K stands 1 1 by a saft Cut by

When in posit on the peop sides should leave a promeoade deck about by m. wide on cither side of deck E.

as a protection for this promenade we shall need a handrail (Fig. 8). This is a strip of wood about 1/4 by 1/4 by 61/4 in. Bore fine holes along it at 36 in, intervals, drive small bank pass through these, and on each drop three or four beads, with a touch of glue to keep them in place. Then hore holes in the deck to correspond,



Erect bulkhead M. deck G. bulkhead N. and deck H. similarly

The overlays which cover the exposed faces of the bulkheads are of very thur wood seneer) or cardboard panted to hok like it. Doors and windows are cut in these. Done paneling is painted on and the windows are filled with celluloid, or silver paper

Sides are needed to enclose these high poop decks. Cut them from this threeply stock, with gun ports and windows pierced, as shown in Fig. 6. These pieces also require an ornate overlay.

Soualt glass beared para may be used at intervies. The riol is to be stained and toe heads on rited silver, but do not put these in position until almost the last Two muniar but much shorter rails

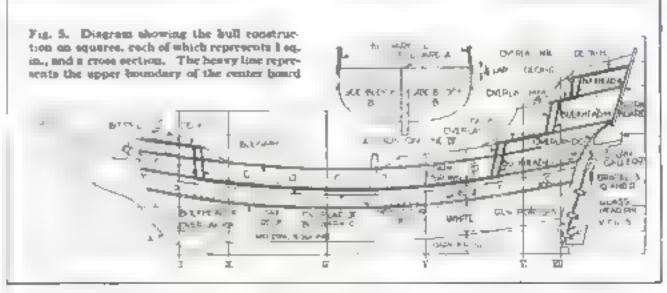
Invert the handrad and tap ato position.

t it the projecting put ends off under-

reath, or cit from before inserting,

will be wanted for the forecastle. Cutor bend them to sud the curve of the how.

The stern board Fig. 7) 30g in, wide and it is in thigh, is fretsawed from a piece. of this wood I untraped on page 91,



Le Mome Wurkship

You Can Make This Galleon

A authorize, from page 50)

such as the lid of a cigar box. The windows are pierced and the whole lightly carved. In the center space, put a little picture of something symbolic, which you may paint yourself, or find ready. It may be a sacred picture, a device from a ogar box, or what you please. Perhaps you can touch it up with oil paints; in any case, var ash it well.

The board is guied and nailed on with *Real. No. 21 were brude a box of which will be found invaluable all through the work.

The figurehead shown in Fig. 7 is cut from a piece of 34-in, suft wood. Before being outlined with the fretaw, it is cut down lengthwise as far as to where the ane of the stem (piece A) crosses it, so that a kg an slot can be taken out and it can be fitted over A. Lightly curve it out away the center with a chosel, and fit it on the ratwater.

Just behind this come the head boards (Figs. 1 and 0). These are cut from bein-

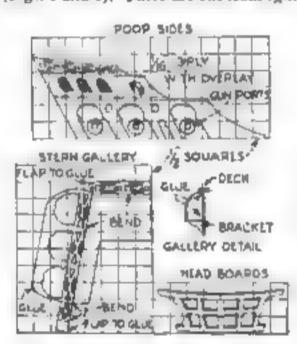


Fig 6. The sides of the high stern and their ornamental overlays, the pattern for the Admiral's gallery and the design of head boards, which are bent as shown in Fig. 1

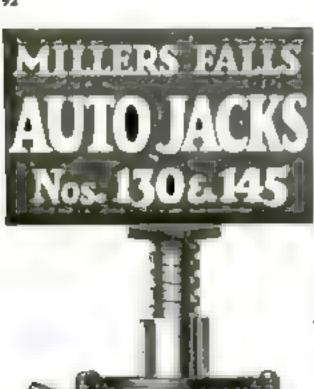
waterproof three-ply stock. The ends are beveled to fit ahove and below the body of the non and to suit the cutwater and tae other ends to meet the bulwark. They will need steaming until they can be bent to the right position. Then they are glosd. and nailed. Other material may be used, as previously adicated

Across these and lying on them, comes a la by M by S is in, spar (an early form of cathead), over which the michar cable passes. The spar fits close under the bowspeil, so do not place it unto you try the latter

Before placing the head boards, bore two spin holes through the cutwater, one under the lion's tail, the other behald it Fug. 7).

Cut a piece of stiff, firethe cardboard to the shape of the overlay OO (Fig. 2), pierce the gun ports and windows, paint it to look like wood, then give and nail it on the under part of the stern, to follow the lines of the after part of the bulwarks and preferably maste them. Out it in the first place a bit Continues on page 93,





This is No. 130 Price

Balloon Tires?

-Then here's your jack!

FLAT balloon tire is swfully A flat, and only a special fack will go under the axle. Here it le-Miliera Falla Balloon Tire Jack No. 130. It's short—but what a reach! Double section gives it 10% http: Smal. - but it will pick up Its share of any car. Two ton capacity hur your wife or daughter can operate it easily. Extension burdle keeps user out from under the car. At hardware, auto accessory stores and garages look it over and ask about the

MILLERS FALLS COMPANY Millers Falls, Mass.





Rome Morkerno

You Can Make This Galleon

large and trum to fit; thus is a good rule to fullow in most cases. The lower edge of the stern board overlaps it.

The Admiral's gallery round the stem is rut from thin presshourd, heavy Bristol hourd, or other good cardboard. It is rather tricky to cut, but abould be approxmately as shown in Fig. 6.

Try out the center cut until it fits snugly cound the stern, when lying on the brackets, of which one is the extreme stern projection of center board A, and the others, Q and R Fig. 27, are ghost and named in position, two on either side and two on the stern. When the gatlery fits, cut out the fretted parts with a sharp knife, bend up as indicated bend in the forward ends, glue the flaps, place it on the gloed benekets, give the top reigns. and spring them under the edge of deck F. Note the small sectional view in Fig. 6.

The stern fantern is cut from a square move of self wood, as shown in Fig. 8. The windows are reassed and filled with saver paper, colored a transparent blue and painted with diagonal bars. The corrier or aments are helt jute. The cenfer staff is a large pin, which is threaded on a botton mont passed through the lantern through another record model

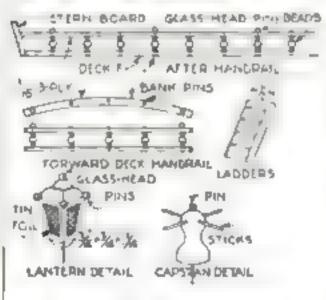


Fig. 8 Details of handrails, laddets "bp. stan, and lantern. Note the ingenious use of pure and brade all through the draign

and then into the top of the stern buned. The capston (Fig. 8) is would about % in, in diameter and 14 in long, cut to the shape indicated. Drill Mein, boles through the bend at right nugles to each other and pass 139-in, long stocks through there for the expetan hars. A long pin or thro nail is driven right through the caretan into the deck

The main tratch of Fig ? is a block of soft wood, % by 1% by 1½ as. The top is punched with the sourced point of a large hall so as to represent a grating. The holes later are painted black, as is the lower half of the hatch the upper part is stamed a dark oak color

The six inddees are made from strips of very thin cigar-hot wood glued together The steps of each ladder must be exactly the same length. The lengths of the lad-

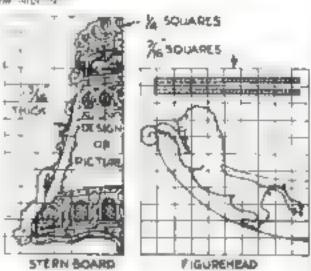


Fig. 7. Half the stern board, and the figurehead, slutted to be over the cutwater

dere vary with the beight of the various decks. You can attach that break were handrails to them of you wish

the bitts one large (U) on the foreside of the foremast, one (T) on either side of the mannesst, and one (T) before the names are nade from square ste av eicher 🦮 or 🤄 m. square as shown in Fig. 4. The cross pieces are recessed geto the uprights and glued. The best way to pitaca the bitin is to glie the ir to the deck and fascen there with this stress from inderigath, but that recessitates pixeing them before the decks are land down. A nother method be to cit holes in the dark are gone the letter very firmly into them. In tant case, leave the vertical memores of the bata long cough to project into the deck.

At the lower edge of the orlop (lower) deck, there should be fastened a lass. molding, ghied and lightly marted,

Another from the about the in sequere should be glued in larg with the top of the open part of the balwark, from the stem to the gallery. Some decorations may be pay ted between this and the top of the beswerk forward and aft.

Below the lower molding, give the hall two coats of white paint above it two coats if right being as shown or the over-The cer fer piece at \$50 warks are statted dark ook and all the woodwork then is given one coat of varnub. The surface should not be glossy.

Next month the rest of the fittings and the ragging will be described.

Those readers who live in New York City and the vicinity will have an opportunity to see the original model of the Spanish galleon made by Captain McCann in the window of an art gallery at the corner of Fifth Avenue and 54th Street. The exhibition will be held from April 19 to April 24 and possibly longer. Other models to be shown by Captain McCann will be the pirate model ship of our Blueprints Nos. 44 and 45, the Torrens, which was Con-rad's last ship; the Wanderer, the last American whaler, and two 17th century decorative models.

We Home Werkshop

A Hand Planing Machine

(Continued rum prov .

and then a cut washer is clamped under the head of the cap screw.

The screw G has a handwheel, which is used to advance the table. The block H is screwed to the table and the hole for the screw is a free fit to allow for the deflection that occurs as the toole rises or fads when the handwheel at irried.

Two blocks, taurked I, are made up and fastened to the frame at either side. Between these two blocks is a steel bar I in square with the ends turned down to lit the bank holes are led as the upper ends of the blocks I. This crosshar then is tapped at the center to take the by-m C S S, thream provided on the screw 6. This arrangement allows the



Under view of the forward table showing the adjusting ways and spring for taking up play

bar, which acts as a but, to turn as the screw is deflected with the rose and fall of the table. The construction is shown plandy in the photographs of page 74.

A stiff spring N is arranged to pull the center of the forward table downward This impressible remaining in close contact with the ways at all times.

The tables, A and B were made up of by-m, plates of much nery steel. It was necessary to place them on the planer and take a light cut. Basels of wood and grinding compound were reed to polish the surface. Eugery and oil or a valve greating compound may be used for the

As described previously, the tables are fnatened to the ways and rests by means of 710 to cap screws. The heads are sunk flush in noles counterbored in the tabletop for this purpose. It may be necessary to use shous in order to bring the tables true with the head and knife edges. When the front table is finally brought true with the head it will require no further smanning as the rasing and lowering of it will not throw it out of parahel

The construction of the bull bearing head is the feature requiring most care The bearings used in this instance were salvagesi from a r automore le transmission. They are approximately 212 in or outside dimmeter and I in in more diameter. The exact measurements of the bearings must be known before the end piates, or bearing rarners of the head frame, may be bored out. Likewise, the shaft will have to be turned to coul rm to the actual measurement of the typer cope of the bearings. It may be necessary to clause the general plan of mounting the fortunal on page of

An article on Simple Pocket Knife Corving will appear in an early lesue.



In love affairs always second best

She had been explaining palmistry to both of them; but when it came to a demonstration she held his rival's hand, not his. "Nothing to worry about," he thought butterly to himself, "except that I can't understand why it is always like this." Always in love affairs, he came off second best.

A great many young men are inclined to have a grimy-looking skin, sported with blackheads and dull in appearance. Few realize that this hinders their success in life. Pompeian Massage Cream helps you overcome this handicup by giving you a clear, ruddy complexion,

Clears the Skin. Pompeun Massage Cream thoroughly cleanses the pores. It helps clear up blackheads and pimples by sumulating healthy cit-

culation, and by keeping the skin clean and the pores open.

Easy to Use. After shaving or washing, rub it in gently. Continue rubbing and it rolls out. bringing with it all the diff and skin impunities, Result - a clean, healthy skin with cleat, glowing color



Use Pombelan Mastage Cream regularly at bone -thru you il get the full benefit. At all druggests.

SPECIAL INTRODUCTORY OFFER

3 of 60c per for 10c



For 10c wy send a special Trib lar contaming one therd of regular 50c contents Contains sufficient Pompeins Massage Cream to test thoroughly is wooderful benefits, Postervely only one (ar to a famuy on this exceptional offer.

THE POMPEIAN CO., Cleveland, O., Dept. 47

Gentlemen: Lenclose a dime the for Wof a 60c jar of Pompeian Manage Cream.

Name

Street

City. Stage



"ATKINS" —A "Lifetime" of Saving!

SAVE time—save
labor—save money
in YOUR home
with an ATKINS
No. 53 Home Saw!
"Silver Steel
makes it of flast two
or three "cheap
saws." Taper Grinding" makes it cut
taster and easier

Ask for our interesting folder "Saws in the Home" or information on better saws for every use

E. C ATKINS & CO.

IND ANAPOLIS & N.A.



The House Were taken

A Hand Planing Machine

of anti-thread from inter-it.

bearings. The simplest possible idea is indicated in the drawing. It is a good plan to arrange the construction to exclude all dust and diet. This is usually a matter of providing feit and diet washers of this metal on each side of the bearings. These appear in the finished machine, but not in the drawing. The head and the shaft were constructed from one piece of 34 in machinery steel. After the bearings were on hand, the ends were turned to the proper diameter and shouldered as in dicated in the drawing.

This was purchased in strips 16 by 1 in and cut to length. It was hardened between steel plates which kept it in a plane. The temper of the blades was drawn to between a straw and purple. The knows were finished to about 36 in, wide by grinding. It might be possible to obtain the tool steel already hardened and tempered.

THE chap breakers are sheet steel by methods. The grouves, which are by means are provided with a rake of 13 degrees, which seems to be about the angle generally given jointer knives. Culp breakers and knives are held in position by means of safety head setseress.

The head may be grouved in the shaper noller or planer. When set up for this operation the cylinder is slightly relieved just ahead of the chip breaker.

The construction of a square head would have been easier, but the one shown conferns to safety head practice

The rear table is provided with a groove or rabbet. This is to facilitate the citibing of rabbets in Jumber.

One end of the brad carries the belt pulley, and the other end scieft long in case it is desired to mount a special inter-kinfe or a small grinding wheel. If these definitely planned, it would be well to turn on threads and provide collars for mounting a 34 by 0 in stone.

A simple fence, C, may be made from a piece of ½ by 4 at cold rolled steel most ted on short blocks. Do of the 1 by 4 in stock. These are clamped to the rest table and a row of holes dulled across the table allows the fence to be moved.

Sliding Rest for Hand Grinder

To MAKE
It easer to
sharpen plane
buts and chivets
on my hand
gender I bond
a hole endwise through
the tool rest
and then made
a clamp to slide
over the wheel



as illustrated. The plane from or chisel may be clamped on this slicing rest to get any bevel desired. It is also possible to tip the tool back to inspect the edge without removing it. -1. C. Barnnage.



You Need This!

It's the Easiest Way to Fix Punctures

You can't help but make a perfect puncture repair with this handy little Shaler 5-Mimita Vulcanizar—it's so simple and easy to use. In an emergency, when you get stuck on the road with a "flat," you can depend on it to make a heat-vulcanised repair that will last, in just a few minutes.

The Shaler costs so little that you should carry it in your car—always. After you use it once you'll know why motorists used fifty million Shaler patches last year.

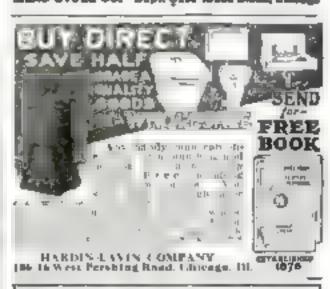
Complete outfit includes vulcaniter and 12 Patch-& Heat Units. You can get it wherever auto supplies are sold for only \$1.50. Slightly higher is Canada and les West.





the sholes of 44 styles, colors and class in the fantous Monditive of histories to keep and are a man is as your news.

Would You then agree to alore your friends and belt teen be referred by the factory price easy farma, names a confidence and except from other we would rouke, all of which we will explain to you if within ten days of sector the post will say in a letter of one postal. "Send particular of filepoint for and address your postal cardor lotter to man over a filepoint of the letter of one postal cardor lotter to man over a filepoint of the letter of one postal cardor lotter to man over a filepoint of the letter of one postal cardor lotter to man over a filepoint of the letter of one postal cardor lotter to man over a filepoint of the letter of the le





Cheaply Improvised Wood-Lathe

By Owen Lovejoy

HOW I made a serviceable little wood-turning lathe at an expenditure of \$3 is shown in Fig. 1. The only thing purchased was the small polishing head; the motor was taken from a discarded vacnum cleaner. The lathe has proved to be powerful enough, nevertheless, to turn out. any job within the scope of my bome workshop.

The first part to be made was a sliding member of wood. This is clamped in a

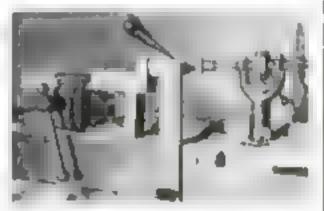


Fig. 1. Inexpensive polishing head converred into a lathe for turning work between centers

vue at the left of the polishing head and allows different lengths of wood to be torned.

To this inilatock was fitted a vertical foot, which determines the height of the dead spindle on which the work rotates. For this spundle a long, stout wood screw was set right through the vertical block. after its tip had been pointed amouthly on a stone.

A abort piece of broom handle then was sawed off and bored so that it could be screwed on the live spandle. The end of the mandle projected for enough beyond thus piece to fit into a central hole in the end of the work to be turned. To engage the end of the work postively, two finishing nails were arserted in the section of the broom handle and cut off with a hacksaw about Ja in, beyond the end of the broomstick.

An upright member to support the turning tool was clamped to the edge of



Fig. 2. The same homemade lathe set up for turning relatively flat work on a faceplate

the bench with a large C-clamp. A handscrew, of course, could be used instead.

When the work is set up in the lathe, the screw that forms the dead spindle is tightened into the wood by means of a serewdriver. Thus vibration is practically (Continued on page 96) ekannoted.



The Telephone and Better Living

Prevuent of pre-telephonic times seem quaint today. In the streets were bornes and mod-splanhed bugmes, but no automobiles and no smooth pavements.

Fifty years ago homes were heated by stores and lighted by gas or kerosene lamps. There was no domestic steam heating or electric lighting, nor were there electric motors in the borne. Not only were there so telophones, but there were no phonographs, no radio and no motion pictures.

The telephone permitted the separation of business office from factory and made possible the effective co-ordination of widespread activities by a centralized organization. It changed the bunness babits of the Nation.

The amazing growth of the country in the past fifty years could not have come had not ecsence and invention supplied the farmer, manufacturer, business man and family with many new inventions, great and small, for saving time and labor. During this period of marvelous industrial progress, the telephone had its part. It has established its own usefulness and greatly accelerated the development of the industrial surts which have contributed so much to better living conditions and to the advancement of civilization.

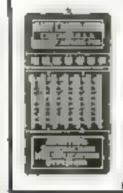
AMERICAN TELEPHONE AND TELEGRAPH COMPANY AND ASSOCIATED COMPANIES



IN STS SEMI-CENTENNIAL YEAR THE BELL SYSTEM LOOKS FOR-WARD TO CONTINUED PROGRESS IN TELEPHONE COMMUNICATION

More Money

Read the Money Making Opportunities on pages 116



"World's Handlest Calculator

ADDS 2 BUSTRACTS 3 MULTIPLES

NEW Will do the work of a in you take or other tracking Connections to be the work of a fact of the grade of the probability of the post of the

If no so when the Reds. tal. on get you make thek. Till U-SANERS IS SANERS IS 1. I will be This is however priced practical particle calculator made. Why pay more for interior imbiations. Order from this ad ruday.

BABY CALCULATOR SALES CO...P. O. Box 1111. Chicago, III.





Practically every household spends at least \$10 00 to \$50 00 each year and many spend several times that much on simple

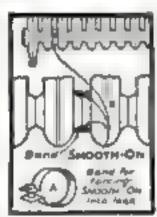
repairs that can be made quickly, easily and well with

Smooth-On No. 1

By keeping a can of Smooth-On handy, you can save this money in your own home—and by doing similar repair work for others, you can make MOREY

No skill is required to make repairs, and the amount of Smooth-On used on any one job seldom costs more than a few cents.

Typical repairs that can be made perfectly with Smooth-On — Stopping leaks in steam water, gas, of or stove pipes mending cracks, breaks or leaks in furnaces and boners, radiators, tunks staks, pots and pulls, making loose handles



Lank at radiator joint Smooth-On

tight on umbrellas, knives, hammers, brushes drawers, etc., t glittering lasse serows backs locks door remahs etc.

On the Automobile: - Making bursted water jackets and pumps good as new, stopping leaks in radiator, hose connections, gas tank and gos, oil and exhaust lines, making a fume-proof joint between exhaust proc and tonneau heater, tightening loose head-

hght posts, keeping grease cups, hub caps, and nuts from loosening and failing off, etc.

To get perfect re-sults, write to us for and use the Smooth-On Repair Book Free if you return the ecopon.

Get Smooth On Vo 1 in 7 01., 1-lb. or 5-lb. fins at any kardware store or if mecessary direct from us.



Write for

Smooth-On Mfg. Co. JERSEY CITY, N. J.

SMOOTH-ON MPG CO., Dept 58, 574 Commun paw Ave., Jersey City, N. J. Please senu che (ree Supoth-the Repair Book.

Address

Return this coupon for a FREE copy of Booklet

Cheaply Improvised Wood Lathe

Continued from page Dr.

Fig. 2 shows the operation of a simple faceplate for flat work, such as small trays. It was made by drilling an octagonal block of hard wood to screw on the spandle of the polishing head, so that the spiniste projects about 45 un beyond it to center the piece being turned. Through this block were set two rather heavy wood acrews, long enough to project into the work about 14 in.

In use, this plate is screwed first to the piece for turning, after a small hole has been made in the latter to center it on the quadle.

For a tool rest with this device, the adjustable aliding member of the first illustration is turned on its aide in the vise.

It is really surprising what can be done in the way of turning small novelties and forminge ornaments by these sumple

In Fig. 8 is illustrated an improvised drill chuck that the writer has used in drilling both woods and metals. It saves a vast amount of thesome hand work

A section of henomstick was dedled out to serew on the appointe end of the polishing head from the lathe. Then, by means of a be-in, wood church the other end of the broomstick was turned hollow and tapering while the spindle was rotating The chisel was rested on a suitable sup-



Fig. 1. How the publishing head is fitted with a becometick thuck to serve as a dult

port while this was being done. Into this tapering hole, which was, of course, precisely in line with the axis of the spindle, the square base of a bit slock twist drill was driven firmly, care being taken not to split the broom hundle. With a little care the bit was centered meely, and by at the writer has drilled as large as a \$1 in, hole in strap steel.

Since the piece drilled was held in the hand as shown, a precautionary measure was used not indicated in the idustration. A stout wire was looped to form a ring around the drill bit, and bent sharply to as to fit through a small hole drilled through the middle of the section of broom handle. Though the bit never showed a tendency to fly out of its chuck. this wire guard made such an eventuality umpossythle

It is evident that with this drill, a hole to be drilled in from must first be marked by a sharp blow with a punch.

Mr. Love joy uses the same polishing head for sawing. Next month he will describe the homemade naw table he made to aid in doing accurate and speedy ripping and cross-cutting.

This Year-Make it a

Real Vacation

UST an ordinary rowbout --- and the Super Eltof Then you have a powerful launch - giving you thrilling, foaming speed — taking you where the big fish walt - furnishing the finest sport in the world for the entire family, The Super Elm is compact - carries anugly on the running board of any car. Light-merely a "one-hand" carry.

EARY STARTING! Even a child can start the fitte Starts on the quarter-turn file of the fly wheel! Gammine stay starting the most wital single quality ever built into an outboard motor RELIABLE! New Super model gives // more power — same weight and price. Write for new 1926 estalog intensely interesting!

SUTO OUTBOARD MOTOR COMPANY Ole Evintude, President

Duot, W. Mir's Home Sidg., Milwankes, Wis.

SEND NO MONEY

Genuine Full Cut Diamonde Chia Torms if Desired B Months No. 4132 - Solid to Pay. Outside U. 3. Ook Men a furtal or Emblem R bit. 3 (len am indi \$25



4-Kr. White Gold J.m. Gold Emblem (any Louge) or any to as (alla frighter) ye I c w or water Oold, initial in Citi-

HOPE RUBY

This -Co- Roy, Trade Made Secretary Secretary Bo didds. Any loan of the local go-liances may be seen following the \$1.5 technique material set into desired from months of the desired from months of the desired from months on the or-dings to be sent for hope from

Ask for Pres implies. Buffalo Jawaby Mfg Co. The Mail Trees Hunter Beyn A 201, Washington Die. Buffah

Ladies' 1 of Genulte Black Once with Genuine Full Cur Damond 14-Kc. ternin, E. T. White Gold.

MONEY

Fits Vest Pocket

Course bed and seem to use figures (her seem on any course of the seem of the



tallable Adding Machine Corp. Dept. 168

Here's a deady change to make money, Energiado seata sue. Flos profit, Write his

Bets Mink Muskrata and other parmate in large numbers with our new folding galvanised STEEL WIRE TRAP

to receive them like a fly trap catches filed. Write for our rate that of Fish bargain Catalog of Pishang Sujudes F Supula me best fish a newn federatching all kinds of fish.

Workshop

Be Your Own Decorator

Cantinued from page 74:

In another container a little of the hurst sienna was also mixed with the gazing

hand to the desired tone.

In starting the stippling, the first step was to prime the undercoated wall with a thin coat of clear glazing liquid, doing about a yard and a half width of wall at a time, from certing to floor. The tinting liques then was brushed on generously

NTHE Everg room, the wory drop black I and the hight steams were applied simultaneously, using a different brush for each color—the buck, which was the predomanating color, being applied to a larger area, and the menna being spotted in at a tervals and accurying smed spots. In applying, the colors were run together somewhat and blemled with the brash to that one color would go into the other enfilly

The suppring was done with a cloth, erumpled and held loosely in the hand and constantly changed to present a clean mir-

face of the cloth to the paint.

The texture of the effect in work of this kit if is gaverned by the cloth used. Sift old gengliam is usually desirable, while chresecioth is generally undesirable, as it does not have sufficient body. With some effects, where a course texture preferred burlap is used. By a twisting and ifting motion, beautiful scrolls are produced. By twisting the hand without any side motion, a resulte or flowerlike effect is obtained, while a sweeping side maxement produces a more branching patters.

The court ig room was done in the same way with the redopender of a of a stencal border design was applied later to set. off the effect.

SOMETIMES a "blended" effect is pro-duced so that the wads will be very light at the top, grown g gradually marker. oward the boot at, where there is considerable depth of color. This is produced by finting a batch of glassing aquid to the time desired at the bottom. Idea pogeing off about oral of the inichire into another. container and adding an equal part of clear glazing houd, to give the light effect decred at the top.

The light in vitire is brushed down about two thirds of the way. Die dark th store brished up about one third of the was, carrying the color well up into the lighter color. The light and dark mixtures are thended together by brushing back and forth. Steppling is started at the top, working down into the darker color-

I few experiments on a piece of wallboard or even on beavy wrapping paper will reveal the many possib I ties,

It will be seen that there is much room for working out individual effects in I ffany " decoration, through muchfication of tone and texture, so that the completed effect may be made to represent one's individual taste.

Sponge stippling, which is mother easy method for the home decorator. will be described by Mr. Elliot in an early issue. You'll want to try it, too.

Only the Auto-Set has this time-saving feature

HERE is a Sargent feature found in no other plane. The cutter of the Auto-Set may be removed, sharpened and replaced without changing original adjustment. If you are now using any other plane, you can imagine how much time and trouble this saves. Furthermore, despite the simplicity of its arrangement, the cutter of the Auto-Set never chatters, even when you are planing across or against the grain or over knotty surfaces,

For the smaller jobs, you need the Sargent Steel Block Plane. This is as carefully made and finished as the Auto-Set. Its cutter, as in every Sargent plane, is of durable chromium steel.

Both of these planes should be on every achool and home work-beach. They are professional tools through and through-yet they are most moderately priced. See them at your hardware dealer's and write us for descriptive booklets.

SARGENT & COMPANY, Manufacturers 50 Water Street



SARGENT

PLANES

\$100 DOLLARS IN CASH PRIZES

See Page 4 in front of book for details

Let Boice Help You Build It!

you. He'll send you the Boice-Crane Handisaw

of any other Rules-Crass puchine or there is there easels that with an estable of a track of a state of the property of the prope

If the tending, for Description Coming of Sec. 4, over 1912s John, a stud Board Section and Coming Section 2015 for E-X Cong Plan.

W. R. & J. Z. BOICE Dept. P. S. 6-B, Tologle, Ohlo







He says: "No job is too tough for a Maydole It'll stand any amount of punishment. And it's got a 'hang' that helps you get the most out of every stroke without tiring your arm.

"You never see a Maydole with a loose head, a chipped face or a broken claw. That's because it's made right. No trick 'features.'—Just a real harmour."

The Maydole Hammer is backed by eighty-four years of specialisation in fine hammens. Head is press-forged of tool steel tempered apparately at each end. Handle is of clear second growth hickory, air-dried

Your dealer will gladly show you the repulse Maydola Hammer in any of the following types

> Nad Hammers Repping Hammers
> Machinists' Ball Prin Hammers
> Automobile Hammers
> Brad Hammers Farriers Hammers Rivering Hammers Timers Hammers Pa ceramakera Hammers Brickingert' Hammers, &c.

Write for Catalog and useful Pocket Handbook 13 B.

THE DAVID MAYDOLE HAMMER CO.

NORWICH

NEW YORK 9045



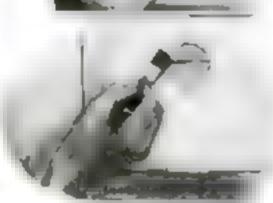
% Shipshape Home



How to Patch Damaged Plaster



Easy Way to Conceal Cracks and Blemishes in Walls



Cut out the broken pleaser (upper view) and mousten edges thoroughly with water (lower)



TRACKS and holes are common blemishes in the average plastered wall. There do not always undicate that the plaster is old and worn, for even new work is likely to have ugly cracks at the corners if the house settles unevenly. A table picture book, or the continual bumping of chairs, tays and other objects often cause unsightly holes. These small defects are easily repaired by one who takes pride in keeping his bome shipshape.

All loose material should be removed before any patching is attempted. With a broad knife or putty knife, scrape out the broken plaster until a solid foundation. has been obtained.

Cut any small cracks a little deeper so as to provide ample opportunity for the new plaster to adhere to and interlock with the old nuclerial. If the edges are undercut the patches will hold better,

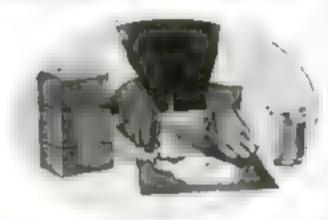
With a small brush or spunge, wet the

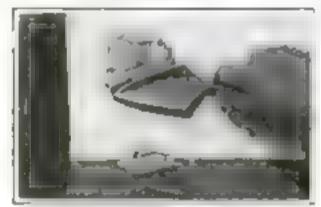
surrounding planter. Thus as to help the newly applied maternal to stock and to keep it from setting too rapidly. A. second wetting mamediately before applying the plaster is desirable.

Special putching plasters are recommembed for the amateur. These plasters can be obtained in small packages at



If a trouvel is not at hand, a kitchen knife, spetule or an ordinary purzy knife will serve





The perching planter is mised with water (upper view) and then applied with a trowel

hardware or paint stores. They do not set rapidly, will not shruck to any ecuaderable degree, and often contain the maing that otherwise would have to be applied separately before any decorating could be done.

Plaster of paris alone is used extensively by the trade for patching small defects. The mechanic mixes a small amount with water and then proceeds to work it off his hands rato the crack with a small trowel or putty knole, wetting the surface in order to trower it perfectly smooth for decorating. The objection to plaster of paris is that it sets rapidly and shrinks away from the old plaster at the edges. A better mixture is two parts of plaster of paris

> and one part of hy drated fime, mixed with thin give or decorators size Cement colors may be mixed reachly with plaster for reparring a colored wall.

The plaster can be mixed in a dish or, better, on a flat nallet of same kind. The plasterer would probably mu a (Continued on page 99;

(Lantinued from page 198)

small amount quickly on his "hawk." A simple hawk can be constructed in a few minutes from thin box material and part of a broken hammer or hatchet han-

die or a broomstick. It is well worthwhile to make one such as that illustrated

finnish paterning has to be done, as when the cracks between a number of sheets of plaster walkmard have to be filled.

If the connercual patching plaster is used, add

water slowly and mix with a large spoon, or work the maxture with a small trowel or table kinfe, until a stiff mixture a obtained.

With a small trowel or table knife, planter the mixture into the hole until it is flush with the surface. Hold the receptacle or hawk below the opening to keep the excess from dropping to the floor.

For a amouth finish, dip the travel into water and stroke to an even surface. For



To match the various rough planter finishes, rub the patch with a carpet covered block

a rough fluish, use a block covered with a piece of old velvet exceet. Dip the block a to water and rub down with a rotary

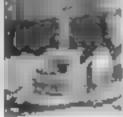
With extremely large breaks, it will be found better to make a two-coat job. apply the first coat over the lath and fill abuset flish with the serface. Allow this to harden, and finish with a second coat. which may be traweled amouth or rubbed rough, as desired.

Tamper for Cement

FOR LAYING Cindler heds for concrete walks and in doing various kinds of

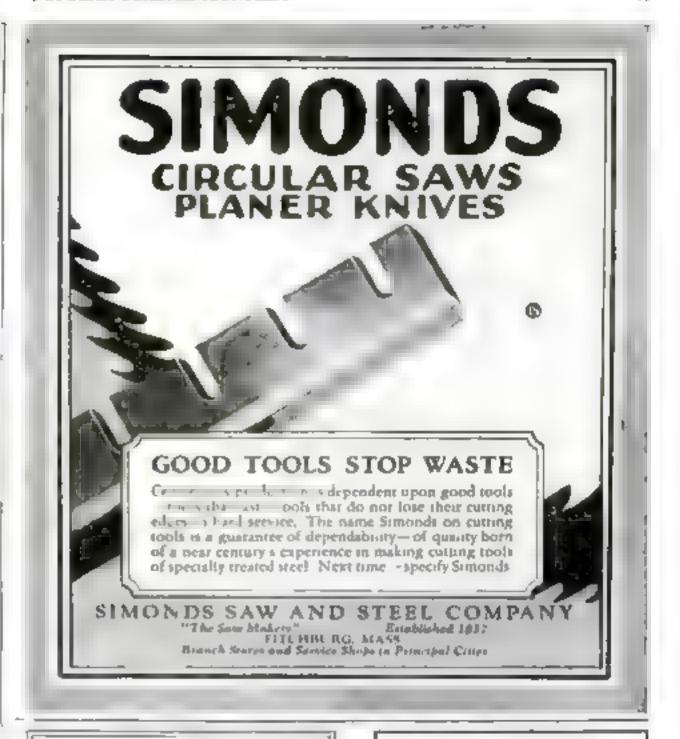
work with cement, the house owner often needs a beavy tamper. One can be made very easily from heavy wooden blocks such as the cuthogs from floor joists ameli can be obtained for the asking

almost anywhere from a frame buildand under construction Select a straight-grained piece



Wooden temper for leveling a cinder bed

of bard wood for the handle and nail the blocks on an illustrated, so that each block runs at right angles to the one above. Use plenty of large mails.





You ought to have this handy Parks in your shop!

Compated or wish to a him delay take a long pooling too one out elipter operating for a s mis-real from a Add to be that are and there are become as well on the carruler.

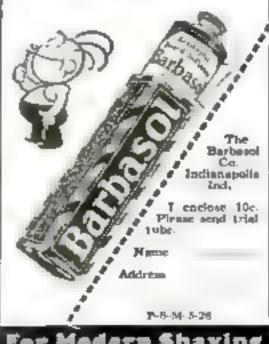
The Parks Ball Bearing Machine Co.

1547 Knowiton St., Cincinnati, Ohio Casalina Partiere: 200 Natio Door Cost, Montreel, Canada



Makes a Man Wish He Had Two Chins

Barbasol produces such a silky shave. And easy—well! No brush. No rub-in. Just the blade and Barbasol. You try it — three times — according to directions. 35c and 65c tubes.



ern Shavin



"He deposits \$500 a month"

SFP that man at the ascelving teller's window? That a Silly' King, Nales Manager for The Secondary, Every much be comes to and deposies \$500

Three years upo be started at Browning's at \$25 a week. Married, had one child, couldn't save a cent. One day he could in here desperate—wanted to horrow a hundred dollars—with was sack.

to proper a hundred sollars with the sixth of the first point and a source some state of the first that the first point advance and I you if follow it. I'll let you have the huntred had take up a course with the international conversion dence Schools and put it some of your evenings getting opened training. The schools was do worst's for your I know We've gut several L.C. S. men right

you I know We've goe second to be notice to be bank.

'That very pight Billy wrote to be notice, and a few days rates he had started studying at home. Why in a few months he had doubted he eating Very thing I know he was pur in charge of his detailment and two men he are they made him Sales. Manager It just shows what a man can do in a little strain those.

Employers are imaging for men with atchildent who who really what to get about in the sweld and are will the in transition with the following the model in the special and are will the in transition and that it had of man. The interpolation will then the first wally and anti-sec in help was interpolate for open tiping between it yets will such below the paper. The it now that investigate out what the I c. it can do for you.

Mail the coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE OCHOOLS

But 711 D Security. Persu.

Ulfred and factor force, produce to the world

Wishman cost prome tell me have a ran qualify for the
position of at the automat perfect which I have marked in A: BUSINESS TRAINING COURSES

Distances la suagement. policy as himspersons.
Personnel therapelletion
Traffic blancapelletion
(the men haw
Light og and Banking Law Agentationsy including the Suchasian Cost Accounting think Employ Private Sucretary Results of Property Results of Results o

Nalramanaban Stone Carl Latterer Banking Law distance the Law Typing the principle of the Law State of the

Clerking Engineetited
Stort in Light in
Machine Stort and in
Machine Stort and in
Machine Stort and in
Machine Stort and in
Machine Stort and
Indian Engineer
Machine Stort and Machine
Machines Administration
Machines Admin

Electrical Engineering Lambitum Architect
Architect
Architect
Architect
Architector arc Ho for
Architector arc Ho for
Architector arc Ho for
Architector arc Ho for
Architector architector
Authoritector
Authoritector
Ago indicate and Positive
Mathematics

4-41-34

March ... fityeet. Address

Blace

Occupation.

If you wride an Canada need the tempor is the Intrine



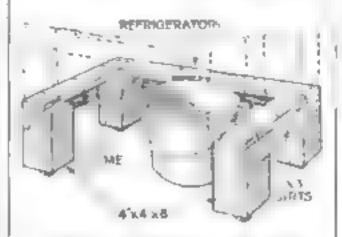
of our word from page the

mproving Your Ice Box

ICE BUXES and refrigerators usually buste puch short legs that

only a shallow pan can be placed underneath to catch the drip. In hot weather the pan may require to be emptied several Luies a duy

To provide space for a deeper drip pair or a good sized bucket and also to reduce the amount of stooping the housekeeper has to do in using the refrigerator, we



Stand for lee box designed to allow a large pan or bucket to be placed under the drip paper

have made it a practice for many years to build a solid frame or pedestal from 8 to 10 m. high upon which to set our ice box.

The legs of the frame are 4 by 4 m | vellow pine, the platform and girth of \$4 in. pone strips. Casters may be put in the legs to make it easier to move platform and hox when the floor or wall has to be elemned.

It may be thought that raising the ice hex bother above the floor would make the see inside melt faster, but no appresemble effect of this kind has been observed. - Havey Jany 101.

Replacing Loose Veneer Sometimes when one is repairing furniture week ug with vencered

wood, or semping a veneered surface for e-finishing, a piece of vencer will be chapped louse from its base. If the piece is replaced in its original position, then strained a few seconds by placing a fairly damp cloth over it and pressing down with a hot from it will be re-glored firmly in place again. After the damp cloth has been removed, set the hot iron directly onthe veneer. It will soon be thoroughly

Should there not be enough glue remarining on the veneer to stick, apply a hitle hiquid glue and try again. After the give is dry, sandpaper the snauth R E. D.

Painting Rough Work

LUWAYS keep my pasulbrushes in caus partly filled with max oil as

suggested in an old issue of Popular SCIENCE MONTHLY and from time to time have to change the oil as it becomes threkened with point. Instead of their ing it away. I pour the oil and any odds and ends of paint I have left, in one large can and use Continued on page Itil,











Factory Mo on hugh this is a little to the test of the test of

Windle for Catalogue AMERICAN TOP & ROUT CO it. Dolan, led

Ma-16 West Pershing Road, Chiruge 1th.

Shipshade Home

"Can't alrest from page 1101

the resulting paint to weatherproof inconspicuous woodwork around my lot, el jeffy my homemade wooden sidewalks. It is excellent for coating joints in outside woodwork and, when thinned with turpentine as a ground or prinning coal for rough words are. Eric B. Rohents.

A Quickly Made Stepladder

ALTROLOR there is a stepladder in almust every house, frequently a sec-

and halder would save a good deal of work if one were to be laid. This is parbendarly true when ceiling work or paper. hanging is to be done and it is desired to use two stepladders to support a long plank. In such cases, or when no stephelder at all is available, it is a simple matter to make one from scraps of wood

an shown in the accompanying distration

The two side present are market. togewher teasparar ly and cat cert on if they were one piere. Then they are separated and the steps, supparts and braces are unded or seriously are inelyin their place as shown. - R M S.



For light repair work

Holder for Garbage Can

the man unto three serves very well as a means of preve il ng stray dogs.

or for that matter, misc nevous boys. from topping over the garrage can Nail the tre to a horizontal position against the fence, post or wall near which the can stands, placing it at a distance from the ground equal to shout half the height of the ear. Lift up the garbage container and set it boddy withou this useful mider C. L. Malatra

Stops W indows from Rattling

A COMBINED BOLL rattling device and window lock new be made from a

common anto door and a nelow antirattler, which usually can be obtained for ten cents. Saw off the rubber disk and grind the end of the arrew to a point Fasten in place on the sill or against side

A TOOUNTERSUNK WOOD SCREW

An anti-rattler lp cae

of window and screw the point into the sash far enough to make a mark. Then countersiok the bend of a flat-bend wood acrew and acrew it in place to serve as a socket for receiving the point ed end of the autirattier F J. WHARRIM







1927 East Madeson St., South Bend, Ind.



SIEGRIST earns a princely salary for his brilliant solos. His mastery of the highest reguter amazes his hearers. He uses a Conn trumpet because, he says "the Intonation, valve action, and Immediate response give added confidence In my playing."

There's probt and pleasure in music. You can fit yourself for it quickly. Start now to cult vate your musical bump with a Conn trumpet, saxophune, trombone, any band or orchest a marriment. Brief pleasant practice enables you to be a picati re and promi-send now for free buok and letaste of Free Trial, Easy Payments on Any Cond lastroment



Powel Crosley, Jr., has developed in the CRESCENDON a device that gives thus **LITUBE RADIO** performance expected in sets of much greater cost



THE CHOS BY DADGE GRP (light hilpsy) of Word and the pro-Designs set Crostey Radios from +97 to 375, and the Musicone Loudspeaker at 3474

M. Bir ha di

Old Bill Says-

TONG attention to small details, → bard study, patient waiting, and usually a good many reverses and disappointments are a part of the game. of learning to be a good mechanic

Half of the job is setting it up.

Use lard oil when arailable for tups and dies; it saves the tools and does better work

When bolting down a jub on the planer and screw jacks are used. always place a hard block of wood, cardboard or paper under them, so they hold better



Old Bill, machine shop foremen

The best mechanics need the least supervision.

Mistakes need not be looked for if you keep the words vigilance and caution ever before your mind

Every mechanic should have a fairly good knowledge of shop mathematics if he hopes to make progress.

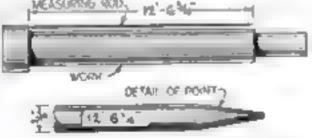
When using a square-nose planing tool for finishing cast-tron, be sure to chamfer the reor edge so that the tool will not did in; and chamfer the front edge so that it will not break off and leave a rough surface on the work.

The machinist who has traveled about a little and worked in several shops is usually more resourceful than one who

Why does one grind a twist drill frequently, yet seldom ever think of grinding a tap?

How to Make Accurate Shoulder Measurements on Large Work

TAKING measurements of distances I beyond the capacity of ordinary measuring tools is a part of the day s work for the man operating a big lathe



A steel rod is a convenient and reliable mesma of checking the measurements on heavy work

or planer. There are several ways in which this is accomplished, that is, with the use of steel tapes, measuring sticks, two-foot rules, or steel rods. The method

depends on degree of refinement required

If the work is to be daplicated or repeated in the future, a street measuring rod is by far the most convenient and rehable means of checking the measurement and it forms a permanent record. It is especially necessary on those classes of work that require the distances to be held within fairly close limits, say i or inin a length of from 15 to 20 ft

To make a measuring rod, select a piece of cold rolled steel from 14 to 14 in. in diameter cut it 14 in longer than the lengto to be measured and point one end as snown. The next step is to any off the distance on some flat surface such as a large surface plate, a planer table, or a In the hed.

Compa parallel block squarely at place for a starting point and measure from this with a scale sembang a hije at each step until the basi distance is marked off Theo clamp a second parallel at this point The two parallels will serve as a gage for checking the rod.

Try the rod, note the surplus length. and turn it back until the rod will go between the blocks. If the rod should be only slightly long, it may be filed on the ends until it goes. If, on the other hand, it is slightly short, it can be stretched by peering the middle.

Fire a flat spot near one end stamp the size and toe rod will be ready for one. It is manipulated in the same manner as calibers or an asule macrometer -L. II

How to Prevent Blueprints from Curling in a Drawer

BLUEPRINTS and tracings that are kept flat as filing-calmet deavers have a tendency to wrinkle and curl up at the edges. When a deawer is being closed, the sheets often catch and are torn or wrinkled. This is especially apt to occur when the drawer in well filled with the prints, and a annexing to any one who prides biniself on his reat work

A sample way to prevent the prioris from catching is to drive three 2-in. fin.

eling pails through the back of the drawer about by m from the top, When the back edges of the sheets are alipped under these ands, lacre is no danger of their becoming earlest.



The sheets are held under nails at the burk

THE PRACTICE of resturpening files is seldom if ever ecunomical. Some of the larger may be recut by factories making a specialty of such work, but resharpened or recut files do not give as satisfactory service as new files. It is doubtful if any economy is effected by their use owing to their shorter life. As a rule the mying is not sufficient to offset the difference in the cost of a new file

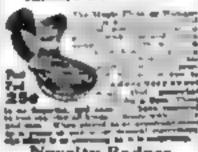


MIDCET BIBLE 460. Li den ber ber bentent. Cl coon, a for \$4.25, \$4.50 per den et Bible, \$60. Every Boy His Own Toy Maker Surprise Matches













booth & Co. Copt. 577 Wheles We

Mystic Skeleton

BOYSI BOY8



into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

a little instrument, fits in the

mouth out of night, used with above for Bird Calls, etc. Any-OUR CAR USE IL

Never Fails. A 32-page book on ventriloquism, and the Ventrile, ALL FOR 100 pestpaid.



TCHING POWDER

Great Fire Eater Mant Security and Teach within Day?









Protego JOHNSON SMITH & CO. 007. 522. RACINE, WIS.



Appearance Tricks Ecough for an Fourth Ferning a Entertainment The ANYONE CAN DO THEM 750

How Much Life Do They Show?

There's one sure sign of life at a machine. That is its record of output on a Veeder Counter.

There's one sure ugn that designer and operator are alive to their opportunities. That's a mounting production-record on the Counter

The push behind development work; the drive behind the operator's work these show in the "Veeder" record. Plenty of agos of life on the job, when it has to register on a



The small Revolution Counter below regulats one for a revolution

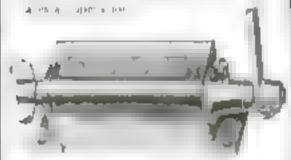
of a shaft, recording a machine operation, or product. Though amail, this counter is very distable;



ate mechanium will stand a very high rate of speed making it especially mit able for light. fast-running machines and most adaptable to eaperimental work If run backward

the counter subtracts Peses \$2.00 Cut 4.5 seen. Small Rotary Ratchet Counter, to reguler reciprocuting movements of small machines, also \$2,00.

The Revolution Set Back Counter below records the output of the larger machines where a shaft-revolution indi-



Sets back to sero from any figure by turning knob once around. Supplied with trom four to ten figure-wheels, as required. Price with four figure-wheels as illustrated, \$10.00 subject to discount. Cut less than one-half size. Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch. presses, \$11.30 lists.

The Veeder booklet shoup instruments that "count every-thing on earth." See them. by sending for the booklet.

The Veeder Mfg. Co. 44 Sargeant St. Hartford, Corm.

Bestur Shop Methoda

Mounting a Heavy Chuck on a Turret Lathe

B. LBERT L DOND

HEY Tom " velled Frank to another workman, just necess the node *Come over here and help me put this chack on will you?

Sure said Tom. "I'll be right

He found brank struggling with a heavy Lyan, chuck on fac floor beside a fidret lathe. The chuck and adapter weighed at least 250 pounds. The two men set it on the ways of the nuchine, but lifted, lugged and tried in vain to get it started on the threaded end of the spendle. If you



The churk a lifted and damped firmly on a boring bar which is mounted in the our ret then it is thresded on the lathe spindle

have ever tried it, you know how difficult

As they were bard at work on it, along came one of the lotal timers. He watched for a few moments and then said "West a immute, box's and I II show you an easier way to do that

He packed up a 3 m boring but bring on a nearthy bench port it in one of the torret holes, and changed it there.

Now fellows he drawled post lift the chirs, up and slide it onto the bar and tighten the jaws on the har. Then a l you've got to do is move the forret aptoward the spendle and pull the belt around by hand until you eaten the thread in the adapter and get it well started. After that just tweet it on the rest of the way and the job is done.

And the Old Toner grouned and passed on down the node

Ladder Shoes Prevent Mishaps

SLIPPING ladders cause so trians and estrial accedents then t every production should be taken in connect on with their use. The ample safety device illustrated is well worth the cost. of installation. It consists of a pair



of east-iron shoes one for each leg of the ladder. The only machining is dr hing a hole for bolt or pm. Shoes are especially useful on wet or oily floors. H. L. W.



A canoe of outstanding beauty

Note the admire the "Old Term Canne" the first time you see it. The trim, praceful lines and the intenty way it rests upon the water will own you at a planer.

But you must actually meddle as "Old I am a fully applies are the advantages of the state (lid own Capors are light in neuro and remarkably easy to handle. They respond instantly to every dip of the blade. They are steady purpose too-perfectly balanced.

too I were tances are patterned after ac-ture indicated of course we have like of self-strong breach the red man a coult but he or good ones have been retained.

filld iwn arrives are low in price too.

"Old Town Canoes"

FOR CLEAR, QUIET "B" POWER



Lasts Indefinitely-Pays for Itself A waster Lands Indefention of the large English and a register of the large of the

A SHOP OF SHIP OF SHIP



Rew Catalog

Umaily

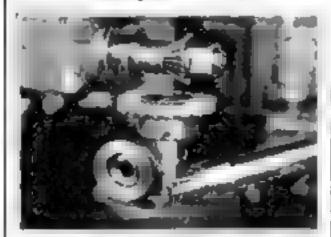
Rudolph Wurlitzer Co., Dept. 17/5

Better Shop Methofa

Expanding Arbor Holds Side Cutting Mills for Fluting

By O. S. MARSHALL

TO PERMIT a clean sweep across the face of blank side culting mills while fluting them on the aides, the expanding mainted abown in the drawing below was designed. Its operation is



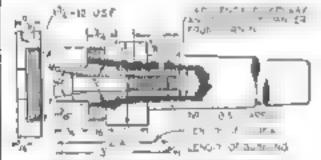
Hose the blank side cutting in it is held on the expanding arbor for the fluting process

made clear in the photographic illustratton above.

The taper slunck of the arbor is made. In fit the dividing head spindle in this case a Brown and Sharpe No. 10 taper There are four parts to the complete orbor, the main actor, an inner split baseling, an expanding screw for the latter, and the returning nut, which holds the expanding bushing within the muoarbor

The expanding bushing has a taper at its forward end, which is to filt the mailing inper withouthe in a number of his center. ng the blank when the closing-in out has forced the bushing to contact with the mum arbor. The leans is finally tapped aga est the closing-in not, against which at rests while being flated.

The blank preferably is fluted on its periphery first, and, in case of large-sized



Details of the expending manded which can be made in several sizes in the work requires

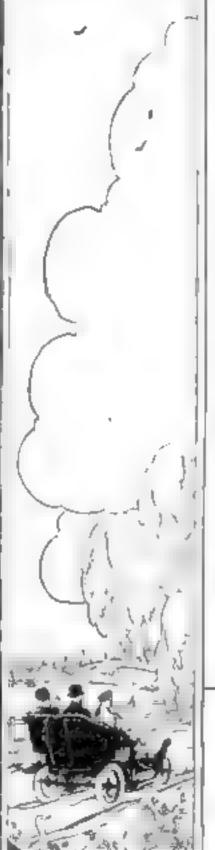
blanks, a steadying pin may be used. beates in the face of the returning not al, a convenient position to enter one of the spaces. This resures against any possible slapping of the blank.

Only two or three sizes of such mandrels need be made, since iput rings may he set on the mose of the taper hasting to accommodate bees of varying sizes.

Putty Useful in Babbitting

PUTTY is superior to clay for closing the ends of bearings that are to be balbitted. With ciny there is always some risk arising from the moisture. Which may cause an explosion and sometimes serious rajury. This danger is eliminated by the use of putty

Light and Power for Twenty Years



NO DOUBT YOU TEMENT ber the first automobile you ever saw. Perhaps you'll remember, too. that it bore a shiny little tank marked "Prest-O-Lite" . . . for Prest-O-Lite gave the motor-car its hrat dependable eyes.

This same company, which has served the automotive industry 40 enccessfully for more than twenty years, today serves radio with a dependable, long-lived hattery, of special deaga, that brings out the best in any set.

You can rest assured that Prest-O-Lite Batterses are correctly fated and deliver full power at all times.

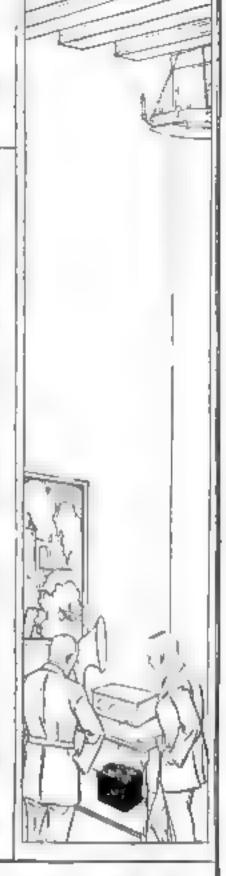
They are attractive ly priced from \$4.75 up.

Ten Print O-Litte Co., Inc. INDIANAPOLIS, IND.

New York San Francisco In Canada : Print-O-Line Concurry of Canada, Ltd., Tentano, Unitedo

> Send for this free booklet.

What every mover of a radio should om about storage business.



Designed especially for radio

MOTOR-CARS AND RADIO



"LIGHTING FIXTURES" Own a CORONA

Ready to hang. Direct from the manufacturer Completely wared, metading glassware. d for New Catalogue 76s. 27 (Inderduced price)

Special proposition to Dealers ERIE FIXTURE SUPPLY CO.

The portable typewelses build have his other mach be Hanfour ow keyboard and big-marking leatures throughour, Wirde to

Cereau Tepewatter Co , Ihc., 113 Main Street, Greton, New York



Bodies of Rare Beauty for Fords at Factory Prices

This Model in Grey Prime.

\$39.50



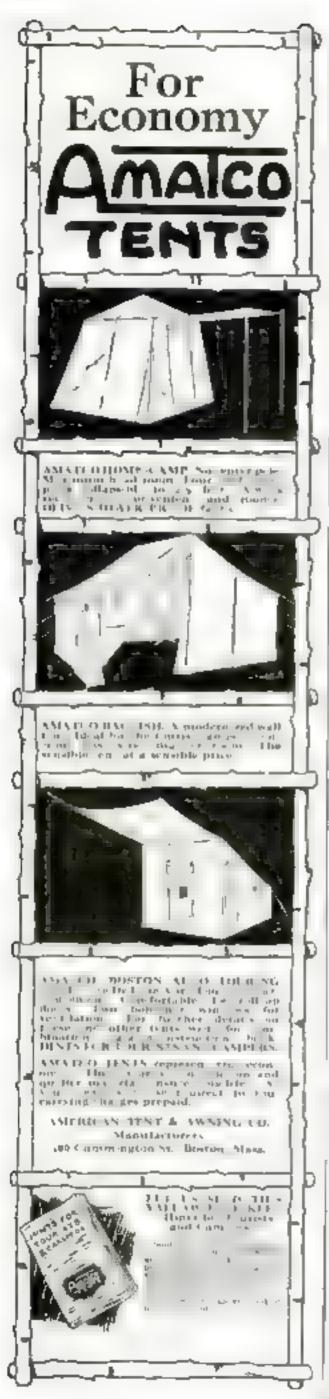
Write for evenber A-10 showing this De I am Model and

\$22.75 and



Sport Body Works, Aurora, Illinois



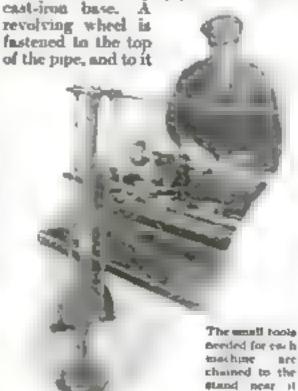


Better Shop Methods

Revolving Stand Keeps Tools Together in School Shop

OR keeping tools with the muchine to which they belong, the firture illustrated below has proved useful and economical in the machine shop of the Kern County (Cahf.) Union High School. One of these fixtures was built for each of the lathes and other machines in the shop.

It consists of a gaspipe acrewed into a cast-iron base. A



are attached steel chains, which carry the various small tools needed for each machine. The chains are welded to the tools so that they cannot become separated

These fixt ires, all of which were made in the high school foundry and machine thop, have more than paid for thent selves by saving time and channating the loss of tools.- G. W. GARBARD.

Electrical Way of Measuring the Velocity of Water

SIMPLE and yet very exact method A of measuring the velocity of the flow of water in jupes makes use of a well. known electrical principae. At the point where the water from the reservoir flows into the pipe, which may have a diameter. of from 12 to 16 m. a bag containing about I lb. of salt is introduced. The rushing water destroys the bag omekly as it is carried along, and the salt dis-

At a distance of 500 or 1000 feet from the intake, two electrories, one of copper, the other of and have been introduced previously into the pipe, they are insoluted from the pipe, but in contact with the flowing water. The electrodes form a galvanic element with a truston of 0 3 volt, as shown by a voltmeter. When the water holding the salt in solution reaches the electroses, the indicator of the voltmeter immediately registers a tension of Jlor 2.0

The difference in time between the moment when the salt was introduced in the pape and the moment when the hand of the voltmeter jumped to 0.5. represents the time taken by the flow of water for the measured or test distance.-ERNEST WELLETE





this easy fingering Buescher Saxophone. Most wonderful music. 3 lessons given on request with each new Buescher True-Tone. Teach yourself. Many play scales right offeary runes first week. You can.

Easy to Play, Easy to Pay

Try any Buescher Interament for 6 days. Satisfaction of no sale. Easy terms arranged. Send postal for cal-about and details of tell-and payment plans. Mention instrument preferred. No obligation, Send today.

BUESCHER BAND INSTRUMENT CO. 1515 Busscher Block Elkhart, Indiana



Eletter Shop Methods

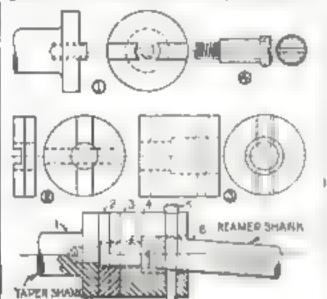
How to Make a Floating Holder for Reamers

By H. L. WHEELER

FLOATING regimer holders of many designs are made for use on turnet lithe work. For the most part they are orly semi-floating because they are rigid in one direction. Consequently the benefit of the floating effect is not available

The design illustrated has a full flusting goant, which overcomes many of the defer is found in the senii floating type. It prevents the reamer from binding in any direction and insures perfect abnessess even in long holes.

The holder is made in three sections of machine steel, carbonized, hardened and ground. The first section (1) is solid.



The parts of the holder and how they are essembled to thouse shapment in resming

with a tuper shank to fit the machine, or it may be made with a straight shank to fit a chuck.

A floating plate (2) between the shank and the nose has a central hole about 16 m. larger than the body of the holding serew. It is provided with keys on one · r and a recess on the other to fit corresponding seats in the shank and gose 4) Plure should be about 010 m. so a pay between project one and slots.

The raise is held in place by a screw (4). paesing through a central hole and into a tapped hole in the shark. The screw must be light against its shoulder, leaving enough room under the head to prevent the whole assembly from binding. There should be about 1910 us, clearance on each side of the plate when the screw is up tight.

A taper pin is used to drive the reamer. This passes through a hole driked in the reamer about and it tight in the nose of the lower. The hole in the renmer shank should be large enough to give plenty of freedom, but not large enough to weaken the shank annecessarily at this point.

Making Grinding Wheels Last

THE rate of wear on granding wheels is increased as the diameter of the wheel is reduced by frequent triing with a diamond. When a wheel is runting contrinously on production work, very light cuts with a diamond about every twenty monutes will keep the wheel shorp and conserve the working life of the wheel.





Fig. 4 hands. The results out a markey ment plays you can upon him 5. 1025 feedings been first that 45 feeds a relience out at least one is not been first to an out to be for the first to prove a be table in the first from our rate to take in the first from our to prove a benefit from the part of the first from the f

Buy Direct From Mill Save 4 Profits

You pre it its save tour big profits in busing direct train at sail. We go an even in hy minister all hundrer on the fit should be a band are bounded in health at the fit of t

Write new for our beautiful book of homes which objects our a core number of land homes. Prived from \$175 up. from to it at over no obliga ion.

INTERNATIONAL MILL & LUMBER CO., E-1 South Woneau Ave., Bay City, Machigan





Work the stiffness out of lame, sore mus-cles with applications of Absorbine, Jr. The magic battle quickly takes the ache away from used muscles - makes them feel new PERIT.

Absorbine, Jr., wakes up the circulation. It combats congestion. Before you know it you are fit again for work or play.

Absorbine, Jr. is equally effective for tired feet -blusters - callouses - cuts and bruses.

At all designate 41 25, or perspect. Send for free trial bettle

W P. YOUNG, Inc., Springfield, Mass.





It's Easy to Build a **Powerful Set**

Using the New and Improved FRESHMAN TRF Low Loss Kit



Straight Line Wave Length Condensers With Low Lose Self Balanced Cells

These are the iden-tical units which have made the FRESHMAN MASTERPIECE

factory built Receivers the World's Greatest Radio Sets."

Complete instructions for building this powerful five tube receiver, written in plain everyday English, together with actual size schematic wiring diagram, are furnished with every FRESHMAN "TRF" KIL

Sold by Authorized Freshman Dealers Only!

CHAS. FRESHMAN CO., inc.

Printence Subbles, New York



No guessing, less wiring and—no grief—with AMPERITE. Eliminates hand theostats. AMPERITE a the only perfect filmment control. Specified an all popular construction sets. Price \$1.10.

Radiall Company

Dept. P.S.-1 50 Franklin Street, New York City.



F-ADJUSTING Rheostat

Old Bill Repairs a Machine

Continued from page 18)

these circumstances. If we were to weld the break, we would have to dismantle the machine, and it would be a week before you could have it running again."

"We surely don't want that," the

president exclumed.

And if we were to holt a patch on." Old Bill continued. "There would always. be the possibility that the screws would come loose, and that would mean that the machine would not be accurate. As for strength, most of that iron is to make the machine rigid; about a tenth of it would do for strength alone, so we are amply atrong in our repair

He turned to Bob Laten.

"Just as soon as you have one of the slots chipped out so that you can measure it, phone the length of the key to me, and I will have it planed and sent out at once-Do not chip corners of the slots square but leave them round, as the drill made them."

AT THE shop Old Bdl made a little computation. He would heat the key about a thousand degrees, and steel would expand six nullionths of an inch for each degree, his key was to be six suches long between the heads—that would be an expansion of thirty-in thousandths. Then, he thought, Laten could not get the seats for the head perfectly flat, and the casting would not fit together as tightly as it ought, so be decided be would plane the hends in m. closer together than the measurement which Laten presently gave him over the phone.

The red hot key would have to be deven in place whereupon the sirrnking would pull the parts together and the key would still be under a considerable load. when it was cool insuring its tightness.

It was just after booth when the fiest key went out, and the other four followed. promptly, so that not much later than the usual quitting time, the keys had all been shrunk in place and the aud operatives were reassembling the machine. It was not until the next morning that the president of the firm came out. He had the machine stopped to look at the repair.

"I can't feel the crack, and can barely see it," he said smilingly, pleased with himself at the stroke of fortune that had

led him to send for Okt Bill.

Curving Light Sheet Metal



used as forestog rolls.

of forming rolls, mechanic engaged in experimental work used a unique method for curving abeet metal. A pulley of somewhat smaller diameter than the shell desired was selected, and the sheet (A) fed in between the pulley and the belt while the latter was

THE absence

pulled by hand. S. W. Brown.



In the best kets

CARTER

Radio Parts

ore specified by the Manufacturers Bremer Tully

Hammertund Roberts Salver Marshall Samuos and others

Your dealer can show you why de Canada et arter flactic et Limited Toronto



"Experiments With 110-Volt Alternating Current"

HERE at last is a book that gives a practical working knowledge of the alternating current The anty may to gain a thorough understanding of electricity is by direct personal experiment. How a practical knowledge of the alternating current can be gained in an interesting and inexpensive way is shows. The knowledge that comes from experiment. is of vaitly more value than that acquired from the performance of the stereotyped series of battery experiments usually described in books on Airernating Current,

The book "Experiments with 110-Volt Alternsting furrent in needed by every man experimenting.

with alternating current.

256 pages, 135 illustrations. Price, postpoid, \$1.75

POPULAR SCIENCE MONTHLY New York City 250 Fourth Avenue



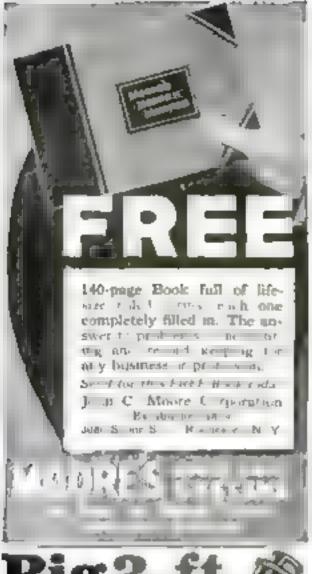
I will put just its bindness as my filter Fortiers agent and Josephan, to also redong for my for its line of candid characters have plants and characters grow sollished observable for fur bushers. We experience needed I furnish greyching. Bower at my new growth purps, Worth pure long or full time. We'lle to buy for catalog, willing plant from Samples and From Fort liver. Kaccheste newhere ACT BUICE.

MILTON CORDON, 1416 YING M., CIO'H. C. Durl. 1000



CANNEL MEM SYLFFON SP. 350

Higger than rower 40 htmls gard space of Small brown. Cas of 4 heatiles l'ord was the first was 4. T.P. up. Heatilises Pumps Toy Finghes, Model Labour of 1 for Whorle & Josef Whorle & Supplies Finghes (Helical States of English Finghes (Helical States of English Adapted to the Pumps of the Chicago, May Pumps of the Chicago, May U. R. A.







Pointers on How to Replace Piston Rings Properly

V FITTING piston rings, several things should be taken into consulerations—the trueness of the cylinder, the fit of the piston, and also the condition of the piston ring grooves.

Assuming that the cylinder is fairly true, that the piston fits reasonably well, and that the piston ring grooves are found to be square, then only an allowance for heat expansion need be considered.

Great pans should be used in fitting the rings to the grooves. The ring grooves should be cleaned thoroughly before attempting to fit new range. The rings should be fitted w thout oil to the groove, and before they are placed in the cylinder, oil should be forced behind the rings to make certain that they will not stick when put in service

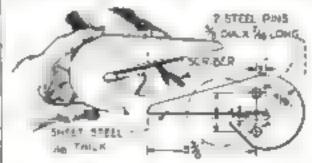
I find in practice that the staggered disepiece convenirs, ring is quite satisfactory. when properly fitted. I also find that the greatest leak usuady is belund the ring and not between the wall and the rang face. The top ring, which suffers the greatest heat expansion and wear should have less clearance at the opening or split than the second and third rings, although this seemingh should be the reverse,

The ring just above the wrist pan abould he placed with the split on the side of the piston that tends to receive the angular thrust of the connecting rod during the work stroke. A good way is to place this ring with the splits at an angle of 90 deg. to the west pin ends. The splits of the other two riags should be placed 180 deg. apart and about 20 deg either side of the wrist pin ends. What I have written here applies only to a motor needing rings fitted. -B. A. Duntar.

Center Square for Small Work

FOR marking the centers of lathe work and for use in various awkward post tions, a center square can be made quite ensity as shown. The square is particularly handy for use in marking rings, as it can be applied cit her moste or outside of them.

A piece of sheet steel and two pairs 14 m. in diameter and 😘 in, long are needed.



A simple type of square for making centers. bisecting rings, and various awkward jobs.

The dimensions of the square may be varied, although those indicated on the drawing have proved satisfactory for ordinary work.

The main precaution required is that the ruling edge of the square should be precisely at right angles to a line connect. ing the centers of the pins and exactly halfway between them. L. M. B.

ASK . . ANY . . RADIO . . HNGINEER



An every-night adventure of Burgess Radio Batteries

NE of the reasons why you should always buy Burgess Radio Batteries is that the batteries used by airmail pilots - battleships - explorers—and the majority of recognized radio engineersare evolved in the Burgese Laboratories and manufactured in the Burgese factory.

These batteries are identical with the batteries sold by your dealer and thousands of other good dealers everywhere.

BURGESS BATTERY COMPANY

GENERAL SALES OFFICE: CHICAGO

Canadian Factories and Officers Nugara Falls and Winnupeg





the pictures. Then take your Harmonics, hold it as shown, place it to the mouth and blow- draw, blow draw. In ten minutes you will have mastered the scale - and when you can play all."

If you want to enjoy ton eathefaction and popullarly that comes to those who play the hermon ca, get a flor nor today -5 is no at all declars - and ask for the Fire least intention Book If your dear - a out of copies write M. Hobner, Inc., Dept 12, 114 East 16th St. N. Y.





JOHN L. MINITING 1. 1. ADAMS CO. BOSTON - B A.

Brush Manufacturers for Over 416 Vents and the Largest in the World



Duplex Mill Does 15-Minute Turning Job in 3 Minutes

By Albert M. Thomas

IN THE repair shops where I work as tool maker, we have to machine the pivot pins on hundreds of brackets used on the gates of elevated railway cars. They have to be turned to a 🔩 in. dianseter at the top and 1 m, at the bottom,

The pretiliar shape of these brackets made the job a testions one in the lathe. The best one could do was four an hour-

Next we tried doing them with a hollow nall in the dral press and though time was saved in the output, we found that it was a hard job to get both sizes to come central with each other,

Mier a little thought, I developed the duples mill illustrated. The notice A has



The parts of the duples mill and how they ere secunded for turning andward brackets

 No. 4 Morse laper shark to 6t the dedltog mark ac spendie. The end is horsel a perfect fit for the entier C and has an mserted key corresponding to the upper end of the keyway in C and also a setacrew to hold it in place.

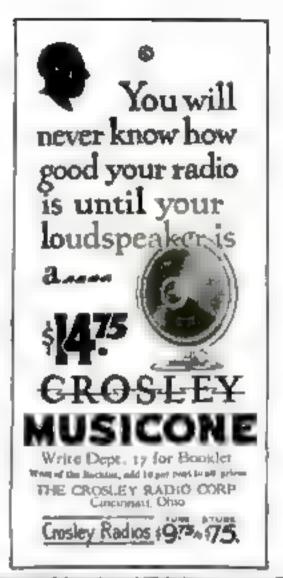
The nut B is fitted on the threaded part of C and has an adjustment of 4; m. to compensate for granding.

The cutter D that forms the 1 m, size is counterbored a perfect fit for the lower end of C. It also is provided with an inserted ket and a setscrew, while in the body foor apenings are milled to accommodale the cottings from C. The cutters are made of good eurbon steel, tempered and ground to size

The brackets are held in the drill press se. By using this tool which cuts both sizes at once a bracket on che done easily. ro three marates. I nousants have a remin

Calculating Drill Speeds

N HGI RING the cutting speed of a I twist drift the encounterence of the drill is these field or calculated on the largest or or safe dumeter and then is not used by the number of revolutions a minute. Twist drills are made in approximately 5.0 different sizes, ranging from .004 to 3 👈 n Drids smaller than 16 m. in diameter are not regularly made of high speed steel.







the point to re. Thousands have pure stully treated threstern at home without hindrance from work-most obstraging cases conquered.



Paid blocks and Grand Pril. Proves of recovery less than a sterior of further as for transact Water the same of Coupen and such transact Water manages Coupen and sund tooky. FREE Transaction Co., 700 Stort Mdg., St. Lesis, Mr.





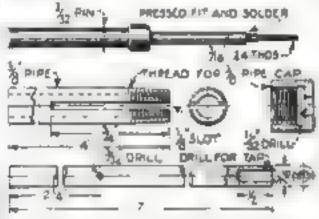
-will start you on the road to success. See Money Making Opportunities on pages 116 to 142.

Better Shop Methods

Adapter for Tapping Small Holes on a Large Drill

SHOP building large oil engines A found that it could do all of the draking on an engine frame under a large radial drill, with the exception of tapping some small holes for cover plates and the like. For these boles the heavy casting had to be moved to a smaller machine or the holes tapped by hand, until the affile device shown was made.

This is a tap builder arranged so that the tap floats vertically. The entry of the small tap into the metal does not mean that the heavy spendle must come with it. As will be seen, the slot and pin pro-



Details of the tap holder, which to designed to ellow the tap to float freely up and down

vide a means for revolving the tap, while Us not restricted in its motion up and

In use, the revolving tap is brought over the hole and started in by hand pressure on the tap holder. The tap can be run in the required depth and the much ne reserved to bring it out with no danger of brenking the tap.

The them, pape is held in the drill thuck and has a cap on the end to retain the parts. The slot must be large enough so that the pm and rod sade freely. The tup can be fixed in the rod by any deared means, although that shown has proved quite satisfactory. -- James Gardner.

Holder for Tempering Pins

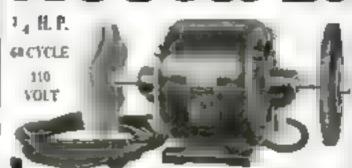
SEVERAL dowels, pons, or small princates may be bookly ened and lenthered at the same tame if a holder made as illustrated is used. It is 18 att, abovet steel bent double and filed at the folded end so that a shot is formed for the puss to enter, The pos are gropped at their upper ends by squeezing the upper end of the holder as shown — H. Mouse.



Vaint holder to clipfive gion at once

To FINISH boles to abilipant eastings larger than 2 in in districter a bar fitted with cutters will generally produce a better hole than ordinary reamers. Renniers of large diameter when cutting aluminum have a tendency to clog up quickly and leave a rough hole or a poor finish.

MOTOR BARGAINS



This Convenient and Compact BUFFER AND GRINDER

Moreor has extra size bunt og bronse bearings

th greate cups and filling cap. A H. H. curd diameter is such thick Emery wheel will sharpen tools quicks without his many Missit thresded connector is from these Lineary where will starped tools quies any notion of line grant threshold to are a standard sacrobs Charle for dell og purposes. Contributed to dive perfect satisfaction or money refunded one or my being et. Write for descriptive circulars and attractive price list on our resupers has in Constant and Variable speed, single and here-plane Motors. All sizes, required Cage and stop Rong speed as heavy encloses features also Martin Rotary Converters for one storing to a 10. We have a line of rebuilt motors of all makes and more at bargain prices. Quantity discount on both new and rebuilt motors on request.

Northwestern Electric Co. Dept. 5, 420 S. Hoyne Ave., Chicago

STEVER COCKADAY All Wave Receiver



Single Control — 4-Tube Receiver

Designed by Never Cockadas and the engineering at all of the manufactures that the training of the manufactures to the training of the manufactures that the training of the same that the training of the tr 8-6 Here or a presented to the net Bushler with an e derformatie. Orali will majo bulginessee. No ne Briefly finds. Since in quelo mit majore in and appropriation that has been

that speaks you are if prose-secution only to the 5-t. However

New S-C Features

Perfected Striple Control Unbinited Wavelength Range I will a next A dame the equals that of part a feet few core Que its apositioned. Heat has been party if at brought bell the aught a blank to of covertus here a mile been burk if to with an object being the better a magnetic brought at an aught by any at another to a contract of the best butteres or element see. Also be proceed as a manufacture of the procedure o

Assembled Easily

8-C satembles is a market of smooth six. A special, the execution is truly displaced of inseparties such truly and the entire the property of the truly in the truly in the entire truly and in the fifth the even that the title is even can assessible the SAL perfectly to a less house.

That parts made by the following reputable quantum are recommended for the S-C by the designers is proof of its true morth:

Belden Mfg. Co. S-C Wiring Harmer. Central Radio Laboratories Contralet Resistance. Polymet Mfg. Corporation Fixed Condenses. Link

and Lock Cips.

Peaces & Co.- Dedled and Processed Front Panel and
Doilled Sub-Panel. Silver-Murshall, Inc. Verseble Condensors, Cod Sochets, Goile, Take Sochets, Versuge Datel.

Mounting Starfets. m. Blog. Mfg. Co.- 2200 A former is

Yunkey Mig. Co. Rheastet, Jacks, Switch.

Get the hand-book at your radio dealer's, or clip the Causan and looks with a cents to

S-C MERCHANDISING COMPANY 64-66 E. Jackson Blvd., Chicago.

S-C MERCHANDISING COMPANY 64-66 E. Jackson Blvd., Chicago

Herewith, death find, a cent. Oir which arms me the horse-work is the new SA. Four Tube Receiver.

Name

Address



Patching Plaster

that fills cracks and holes easily and permanently

ANYONE can use Rutland Parching.
Plaster and make a perfect patch. Comes in handy curtons, all

ready to use. Just add water.

Unlike plaster of paris, this remarkable planter does not dry or "set" instantly. That's why it's so eary to may. The patch will not shrink, crack, crack, crack, crack, You can paint or paper over it without shellacing and the parch will not "spot" thyough

Paint, wall-paper and hardware stores sell Rudand Patching Plaster. If your dealer base I it, mail cos-pun. We will send you a Z²3 ib. carton and you can out the pustmen 10c plus postuje open delivery land Pite Clay Dept. R 5, Ruck t'o. Yermont.

A few of its many other wer Manding optida walls. Pointing brick erpell, Conting though of

ret hours. Sent hy small crecks where insects or vacualn enigt-

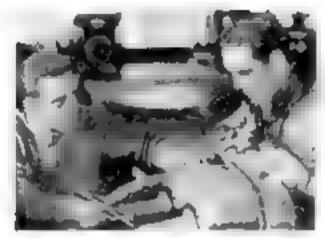
As a tagring to hold loose tiles in bathroom walls or door.



BUTLAND FIRE CLAY CO. Dept R J, Ruttand, Vermont Send me 21/2 ib. carton of Rutland Plastee.

Address

My dealer's name



Big Salaries Paid Automobile Experts

Factort growing industry in U. S. A. offers annoual opportunities to trained men

THE automobile industry is one of the biggest and insies greet as industries in the Conted States. There are more than 18,000,000 cars registered in this country and the number is increasing every day

The best way to prepare for success in the automobile field is to study and there is no latter way to do this than through a home study course with the Interna small Currespondence Schools.

We say this because many of the leading figures in the automobile would taxlay are former I C S, and once. The incident I fore G. Vincent Vice I remient of the Packard Motor Car Co. Water P. Chryster. Pleastent of the Chryster hour terromain k. V. Eddie") Suckethacker Hieron Walker, Chief Engineer of the Charatter Motor Car Co., I V. Whitherk, President of the Conceand Automobile Co., and other men equally an amount.

Just mark and man the company and well send you information about he I C 5 Automobile Courses or any other course in which you are interested.

INTERNATIONAL CORRESPONDENCE SCHOOLS Sex 7882-O Bermites, Pante.

Oldest and Impact ow repositioned activate to the world Without each or with do not on the part, plants to her they be an quality for the pure time or to the subject before which I have marked an X

Complete Automobile Course Automobile Bleetrie Equip-

Thathesis Management Tradition that Management It economic the particular Up a Richard States (1984)

lymprings and Indicate and Habilitae fam.

As community torons of P.A.

Notether Chat Actioning

Brokersteing

To as Members

[Position | Feetiah

Complete Gan Engine Complete Gan Engine

The refer for the test and the first test and test and the first test and test Ambiliert

[_dalesmanship

interesting

Thether Letters

Thether For Lettering

A highester for Typing

District For Salt

I See to

Hatter 51 Clerk

Compount Shoul Subjects

Plate

Name No bed Address

Chr

If you tested in Canada, send this ensure to the Interna-

Every major abouted source or

Petroted Complete profes the of worth diplos.

Complete profes to of worth on the will properly the worth of N N given a perfect of which is a second of which is a second of the property of which have been applied to the profession of the profession of the property of the profession of the

Morelly Exception Company & & B Points 1072 Bryant Avenue - New York Dity

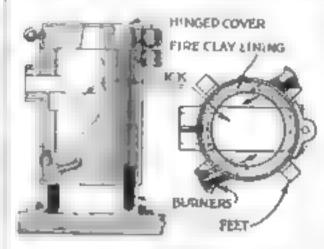
We need a few good once in our espanisation

Getting Ahead?

Read the advertisements on Pages 116 to 142 this issue if you want to get ahead! Beiter Shop Richart

Gas Furnace Used for Heating Tools at the Bench

'HE gas furnace illustrated was made by the tool man of a small shop and is intended to be kept close at hand on the beach. The shell is of pape with the



This small bench goo or of Parnace is a claylined gape with an old brake drum for a cover

bottom and feet welded on. The cover is made fewn an old brake drum.

The burners, flared beli-monthed, are welded in, and are tilted slightly so the flame follows a spiral course upward. The furnace may be used for either gastor od by providing the proper burners.

The bong of the furnace and cover is fire-clay, carefully applied as dry as pos-

sible - FRANK N. COAKLEY

Universal Boring Bar Joint

WHEN a large boring bar is held in rigid almement with steel guide hosbings, trouble at nometimes experienced from binding or chaffing. This diffinity is accentuated if the har has to pass three or more bushings, as is often the case in large jigh,

The trouble frequently is traced to unperfect absenced of the gorde hisborgs with the much ne spoudle. A simple remedy is to use a universal joint for conneeting the bar with the spoulle. This conally will overcome the difficulty and medentally save time wasted in trying to correct the foolt. The idea applies to vertical or horizontal machines.

Draftsman Uses Wedges to Aid in Drawing Threads Quickly



TEDUES to go between the head of the T-aquare and the drawingboard will save a draftsman's time and insure uniform angles on threads, bevels of structural shapes, and the like. They can be made as a few minutes of hard wood planed to the desired angle. Two large thumbtacks prevent them from falling out of place.-W. I BIMAN.

Makes Old Ford a Tractor

The Sprangh Americans, for converting to Freed Ages Charms with engine onto a family Farry Tractor. Just right has broke grawors, analyticans converses, of Paris 16. Paris Deals Seems, Calthronics, thous field Machinery. By also back Conten Frances and Carter flar Wester Americans.

Write for Fine Portlesion Show High Co., Days P. Galecius y. Kan.,



Squab Book FREE

Printed in COLORS, Enlarged, Much Have,

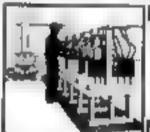
BEND FOR THE INTERNATIONAL DATALOG



mentan m relens a sed Fords the Property of Factory to Factory to

prime flat

POR PARTY Prices from 6.27 del sis. F. international Budy Works, 914 W. Ohio R., Bupt. I, Chicago, M.



State to de Appletonistable propose with the first time force to be to b the end the military the back willia and more than I BANKS.

HOBART GROB, GO.

Des P 5 Troy Ohio.

ONLY \$16 NO MONTHLY -



Intel- paper morne peck str time cut met le from factors From Factors and of tame of the first of tame of the first of tame of

BUCHSTEIN'S FIBRE LIMB







See Cash Prize Offer on Page 4 in front advertising section

Try this Yardstick

MEASURE YOUR KNOWLEDGE with the POPULAR SCIENCE QUESTIONNAIRE

- L. Why does radium continue to give out hear for thousands of
- 2. Are the stant solid like the earth?
- 3. How was the earth formed?
- 4. Why is glass transparent! --5. How do we know that the
- earth is slowly sheinking? -
- 6. What as not electric current! --
- 7. How was petroleum formed? --& Do electrons really move through were when an electric current is flowing through it! -
- What physical changes in your budy are produced by feat!
- 10. How do mascles exert power!
- 11. What ere X-rayel
- 12. Can we see atoms wish a majoriecopei -
- 13. Why does hest expand things and cold contract them !
- 14. Why does the moon annear to though its shape from time to Hene ? .
- 16. What is the brain made of ?-
- to. Why is it possible that the in-side of the earth is growing horser instead of colder?
- 17. Why is frost more likely on a clear night than on a cloudy
- 18. Does thinking use up the thinker's energy in
- 19. Which travels faster, electricuy or light?
- 20. What simple test will distin-
- 21. What makes the notice of them-
- 22. Why would men ultimately sufficence if all the prees plants were killed?
- 23. Does the boiling of water remove the impurities in it?
- 34. Hay do the living cells of the body gettle energy with which to do their work?
- 15. How is the speed of light mea-

TOTAL PERCENTAGE

THE YUCKE

SUIVE

UR Brain

EVERYBODY is talking about the famous "Popular Science C Questionnaire." Doctors, Lawyers, Professors, College Gradnates and thousands of others have tested themselves with this Questionnaire. In the panel is the list of questions of which the Questionnaire is composed. How many of them can you answer?

Like an Old-fashioned Examination

May we ask you to make this test carefully, reading the questions slowly and giving thought to each one? When you cannot answerone satisfactorily to yourself, put a zero (0) beside it.

On the other hand, give yourself credit of four (4) for each satisfactory answer. Then when you are through, see how near you have come to making a mark of 100.

This is like an old-fashioned examination, but you will find it fascinating. The questions all have to do with the wonders of the world we live in. All can be given quick and straight forward answers by any person of education.

All of the questions in the famous "Popular Science Questionnaire" and many hundreds of others, have now been answered. for the first time, in one book-THE POCKET GUIDE TO SCIENCE.

All that you probably ever will want to know about science is told in this one 284-page book that will fit in your pocket or grace a library table. Curiosity-satisfying facts about the world we live in aremade instantly available to you in simple

> question-and-answer form in THE POCKET GUIDE TO SCIENCE.

You are assured of the accuracy of the answers in The POCKET GLIDE TO SCIENCE because it has been edited by Dr. E. E. Free, who has remarkable genius for condensing the known facts about scientific questions into easily remembered paragraphs.

SPECIAL OFFER

THE POCKET GUIDE TO SCIENCE IS not for sale. It is offered to you without one penny extra cost with a 14 months' subscription to Pop-ULAR SCIENCE MONTHLY.

POPULAR SCIENCE MONTHLY "CATries on" from where THE POCKET GUIDE TO SCIENCE leaves off. THE Pocker Guion gives you all that the scientists have discovered up to right now-Popular Science MONTHLY will give you all the important, interesting and new discoveries of science for the next 14 months.

It takes over 300 articles and pictures every month to tell the readers of POPULAR SCIENCE MONTHLY all that has happened in the scientific, radio, mechanical and automotive fields.

Your Name in Gold

Tim Pocket Guide to Science is bound in beautiful dexible fabrikoid. We will stamp your name in 22-carat gold on the cover of The Pocker Guzda at no extra cost to you if you use the coupon below (mmediately

We extend to you the Special Offer of 14 months' subscription to Popular Science Monraut (regular price by the month would be \$3.50) with the THE Poc-KET GUIDE TO SCHEICE-all for \$2.95, plus the postage. If you are already a subscriber to Popular Schwer we will extend your subscription 14 months if you accept this offer.

Into this cost brilliam book of 284 pages has been condensed the Outstand ne facts should the world we

SEND NO MONEY

Send no money, just the cou-pon. If within 10 days after you receive the book and magazine you decide that you are not satistical in every particular, you may return them, and your entire payment will be refunded promptly and without question. Could any offer be fairer?

POPULAR SCIFNCE MONTHLY 250 FOURTH AVENUE NEW YORK

	P. S. 5-29 [
POPULAR SCIENCE MONTHLY 250 Fourth Avenue, New York I meet your effect of The Present Course to Science months substration to Popular Science Monthly 1 popular by us, plus the popular when he desired the Popular of the popular when he desired the Popular Science Monthly and the Popular Science Monthly and the popular Science Monthly return to present in the I will return to present in the I will return to present the days and you are to presently refund my full payer to days and you are to presently refund my full payer to days and you are to presently refund my full payer.	pt and a 14 gill pay the cust Guirt ie book and
Next	
Cut- 16 was prefer send \$1,95 with your order	
Cut - 16 you prefer would \$1,92 white period	



There's A "RADIO" Bungalow In The Size You Want!

THESE standerful Summer Sungalous are now your in 8 steel, verying from 3 to 5 remains with pourb

NTRODUCED for the first time has summer the Hanneyt finds Budges a spring and market supplied by assuing anestoroiste exercisher. Where he washers or companyed the family of he whall the for given

IT dependly accorded by unshalled inbow within a lay and a hart. Being really portable it can be also down durch a such out up again a hout to in de. Standing ought harts for years. The consistency represents

Send 200 for our new 44 page retaing F. O. B. BROOKLYN

Priced S from

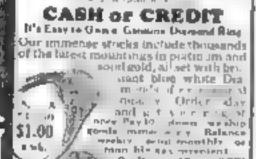
"RADIO" Garage

Only 295 Brook

clandwarely designed in the section A ring year, at the property by said lines at the property by said lines at the property by th

can be street. Do work in Carried in each for smooth Folians home neasticle linger. diagram application

LOUIS BOSSERT & SONS, Inc. "Largest Lumber Plant to the East" 1310 Grand St. House Dept. Brooklyn, N.Y.



Copt. 20 171 100 to State St. Chicago, Ill.

Sag Danmard Book PREF 17 10

The Greatest Sea Rescue

(Cardinand , non-page 14,

snapped the Luc' In desperation, the rescuers tried to send lines over by tying them to floating casks, but the breakers awept the casks out of rench.

It was at this desperate point that Chief Engineer Turner searching his mind, let upon an idea from the experiences of his boyhood. He built a kite seven feet high and four feet wide, with two wooden crosspieces covered with oiled linen. For his string he found a ball of stay lace used for engine packing.

WE'LL dy the kite from the deck," he told his men, and when it is well up and beyond the Intraor, we'll drop it by suddenly paying out the string. The string will fall on the fatimer's deck, and her crew can haul it in

That this idea was a thoroughly peactical one was venered for a few days ago by Dr. Miller Reese Hutchson, consulting engineer of the Naval Considing Board, when he proposed a combination kite and beceches buoy device as a substitute for the Lyle gun. Only notend of dropping the kite, as Turner proposed Dr. Hutchison would pay out beavier and beavier line, making the kite drag it along until it touched the side of the derelact vessel. Then with the aid of this line, it would be possible to pass from one vessel to the other the cable for an ordinary breeches buoy strong between the curgo masts of the two slops.

TURNER'S hate however, was not flower during the reside, although it was fixed out later by a number of the passengers. In its place the engineer but upon mosther sten-

It was apparent that the projectile, on leaving the gim, did not speed away on an even keel, more first, but turned end over end through the air. Would not the sudden jerking strain on the line he rebesed if the length of the spindle were increased, thus making the projectile swing in a wider are? And why not further relieve the jerk by means of a spring?

It so impressed that among the passengers on the Hooserelt was an American artiflery officer Colonel Chut C. Bearn an expert in the science of ballistics. With him Turner discussed his idea, and then turned again to his much be shop.

This time he made the spindle four feet long instead of eighteen meles. He made a speng of brass righth usch wire which he wound into a spiral over a bar revolving in the lathe. One end of the spring he fastened in the eye of the spindle. The other formed a loop for the shot line.

When the shot was fired, the spring eased the perk, and the line held. And so out of the stress of gram necessity was born a worth while invention

I few days after the return of the President Romerelt. I visited the Brooklyn home of the ship's chief enginery There I found him in the throes of building a radio set. Wires and solder and batteries were scattered about. He had burned a hole in the rug with acid, and has good wife was scolding han roundly

"kon sec," he chuckled, "I'm just getting in practice for another Antimor."



Did You Know

That you can get Heaten Confer-aude special for you? I every parde ton must e un l'aid'e carept that is the they are achieved to those of Von segmenting air first long trousers. Heat the great garden security they look tender serar butter and fee by they

but there was wear knockers, sak for the Sunder boston Center

George Frest Company, Makers, Besten

maze Your Friend Chemical Tric The

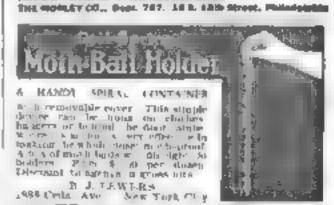
Bun s He ad march p. Chemistry ROTH EMCRAFT THE POBLEM 135 Washington 51 ICAL CHIN

Representation Md

PUSTIN

Thear you, I can bear now as well as any body, 'HOWP'
With THE MORLEY
PROPERT The a pair in styleste now but they are inventile I would not know I had themen, myself only that I hear all right." The Marier Phone for the DEAF to n the sum what

glames are to fie eyes. In windthite, resultations weight have and imposing Asymmetric and adjust it. Street she handered the made until Worten for browthed shed involved all its brown and the large meaning for the contract of the c



What Could You Do with \$50-?

See the Cash Prize Offer on Page 4.

Can You Solve the Greatest Puzzles?

Continued from page 25

a square box in regular order, excepting the 14 and 13, which were transposed. The guzzle called for the moving of the blocks through the medium of the vacant satisfie, with the object of bringing them .e to regular sequence, with the 13 the final number, as in the diagram.

LUDICROUS tales were told of the havor this puzzie wrought in all parts of the world. Although thousands claimed to have solved the puzzle, no one could recall the sequence of moves whereby the feat was accomplished, and none of the alluring prizes offered for the solution ever was collected. The pusale is unsolvable, for the reason that when the 14 nm l 15 are reversed, compensation must be made by reversing two other blocks.

The Pigs in Clover puzzle which in the 'eighties succeeded the "14-15" as a world disturber, was, strictly speaking, not a problem, or puzzle, at all. It consisted of a circular cardinard box filled with a series of partitions, having openrogs through which a number of marbles were made to pass by abaking and rooming the box, the object being to drive all of the marbles into a central pen. It was designed as a child's toy, but proved to have such alluring qualities that grownaps became absorbed in the pastone.

In the sequence of world famous puzales my Mosong Ch ontown puzzle, which made its appearance in 1800, next caught the popular famey. Many readers undoubtedly will greet this pupile, which is reproduced at the top of page 24, as an old friend. Those who are not familiar with it, I am sure, will be repaid if they cort it out of the magazine according to einer bann at diathetr ptiats solute an.

I introduced this puzzle primarily as an advertising noveles. My first large customer was Carl Lacuade now a well-known matter-pretage producer, then non ager of a department store in the Middle West. Among others who used the imazle for advectising purposes was the enimpaign manager for Walnus Mc Kadev in the latter's mee for the presspency uga test Widsam Jennings Bryan in A in liton of these passles were distributed that year in the interest of the Republican canondate.

I TMAY interest movie lims to know that when I showed this purale to Mary Pickford a few years ago, this sharp-witted title lady, who, like her hisband. Douglus Fairbanks, of a good pozzier, after a period of concentration on the shifting circle, proved beeself a better solver than untild thousands of other pazzlers by correctly as sweeing the question, "Water man d sappears? Her reply to the puzzle's secondary query, "Where does he go?" proved to be too complex for mental assimulation by any member of her gallery. See how well you can do with this puzzle.

Another puzzle that attracted water attention, which I first brought out m 1000, is that of the Three Houses and Three Wells. You'll find this puzzle on page 24. I unbentatingly nominate this as my best puzzle," on the score of m-

genuity and its interest appeal to potalers. It seems to enjoy perennal popularity Notwithstanding that it has a perfectly fair answer which I have published repeatedly, seldom a day passes without somebody writing to ask if it can really be done. These requests have come from all parts of the world, and for years I have kept the solution in printed form to take care of the numerous inquiries.

THE Clock Dual puzzle, which is repro-I dured on page 24 is another whose popularity has never waned. Requests for the solution have reached me almost daily since I introduced it in 1909. See whether you can work it out.

The arrangement of punibers in the form of squares so that they will add up to the same total in every column and row as well as in the two diagonals in without doubt the oldest of all mathematical puzzles, "Magic Squares," as these arrangements are called, were bold in veneration by the Egyptians, who upputed to them real magical power, and to this day Chinese and Korean soldiers carry charms in the form of magic squares to protect their lives. An interesting paixale lusted on the magic square principle is presented on page 44.

It is astonishing and amusing how frequently this puzzle is reducevered by modern mathematicanas. Severs of times this old puzzle has been offered to me for exploitation by ancere persons, who happen to be several thousand years late with their impiration,

NOM time to time I have originaled Finathematical problems based on a complication of facts concerning ages. These usually can be solved test by algebra. The most popular of these was the following, which I present in its original

How Old Is Ann?

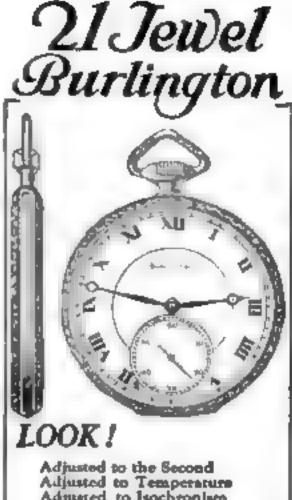
Johnny had a work ug agreement with his aisters covering the suppresson of family history, so when the census man argured us to the ages of Mary and Ann, Johnny clouded statistics in the following truthful statement: "The combined ages of Mary and Ann are 44 years, and Mary is twice as old as Ann was when Mary was half as old as Annwill be when Ann is three times as old as Mary was when Mary was three times as old as Ann."

How old is Ann?

wording

Can you figure it out? It's really not so complicated as it sounds -if you go at it quietly and unharmedly. Anyway, I am going to give you the auswer, and the solutions to the other puzzles I have presented here, and tell you some more about possing, in the next issue of POPULAR SCIENCE MONTHLY

Thus is the first of two intriguing articles in which Sam Loyd relates the experiences of a lifetime of "puzzling," and presents for solution the pazzles which he regards as his best. The second will appear in our June



Adjusted to Isochronism
Adjusted to Posttions 21 Ruby and Sapphers Jewels 25 Year Gold Strata Case Your choice of Dials New Ideas in Thin Cases

Only One Dollar Down will buy this masterpiece of watch manufacture. The balance you are allowed to pay in small, easy monthly payments. The Burlington — a 21-)ewel Watch — to sold to you at a price much lower than that of other high-grade watches. Besides, you have the selection of the finest than model designs and latest styles in watch cases. Don't delay! Write for the FREE Watch Book and our Special Offer today.

While this Special Offer Lasts

Oct the Burlington Wetch Book by sending this coupon. Find out about this peat operal offer which is being made for only a limited time. You will know a great deal more about with heaving when you tred this bank. You will be able to meet clear" of the over-priced men has what see up hence. Remember the Burington is sent to you for only One Dollar down, belance in small monthly payments. Send the coupon for watch book and out special offer Today I Do not devry one minute!

Burlington Watch Co., Dept. 13 64 19th 5t and Marshall Blvd., Chicago, Illinola Canadian Address: 43 Albert St., Winnipeg, Man.

and district and district because the second because the second of the s

Please send me (without obligations and prepaid) your free book on watches with full explanation of your \$1 down offer on the Burlington Wetch.

Print name and address pismly

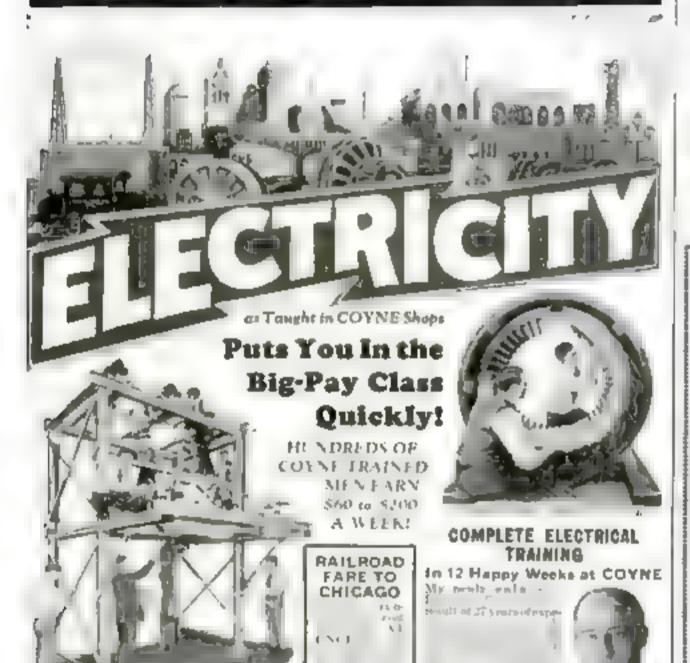
	Address		 	 -	
=					



Making Opportunidies For Penular Ssience Readers

Readers of POPULAR SCIENCE MONTHLY will find scores of apportunities in this section pages 116 to 142 for making more money

RAILROAD:FARE®TO:CHICAG Included Without Extra Cost II You Act RIGHT AWAY!



Yan Don't Need Advanced Education

Actionical Education of Experience (a)
Learn at COYNE
Experience (a)
Experience (b)
At and Prikse (b)
Instanting out the Prikse (a)
Prikse (a)
Prikse (b)

Send for Bly FREE Book! Send for a out of my big attract or i ser-scinni with the 2x 5-in size 1 mounting of phonos of electronic region auto- atrolame permer ric Absolutely



e All It hall projections, County carminage policy (Sectional Section) nikn b

We Teach Electricity and

Nothing Else

ten has only ONE thing bil ally We are SPE the Cur of terrors are not dicaded not is [Best only a published or has a no additional appearant up

the Year at COYNE - No Classes or Seasons. Get the Coupon Mailed Right Away so that You May Read Full Particulars of My Course My But FREE Book will Amere You! 1-bb Dtaff Aby Day of

SEND COUPON NOW

M. C. LEWIS, Provident COYNE ELECTRICAL SCHOOL 1309-10 W. Marrison St. Dopt 1345, Chiango, Historia

bleur M. C. Beno one of those old handsome FHFE 2 oder book with it phat empts. He sure of telling all proofs B. R. Fore Offer and Special Courses with the course was

Мялов

<u>Address</u>

Tune in on COYNE Radio Station WGES



H. C. LEWIS. President 1300-10 W. Marricon St.

Katabilish Bopt 1365

There is no Substitute for Personal Training, in Great Shops, on COMPLETE Apparatus

Do You Need a Self-Starter?

I and the next of the private A.

Dear Su

Whenever I or me to the advertmement in the Money-Making Opport raties Section referring to the Notherial Salesmen a Training Association, I always purse to express my respect for that Institution.

About a year ago I investigated the merits of the actual to see what it could do for my step-brother, and was so pleased with the thorough manner in which a novice is drived in the promples of the art of salesmans 'p that I numediately enrolled my brother making the payments out of a meagre teacher a palary. I am uned an page 11

\$100 in

POPE DATE DOS DOS SOS ESPECIOS POR OS ROCADOS A PORA ESPACA DA ESPACE DA ESPACE DA ESPACE DA ESPACE DA ESPACA

CASH PRIZES

For the best letter of 150 words or less answering the question-

"What advertisement in the 'Money-Making Opportunities' Section interests you most-and why?"

we will pay on June 10th the following-

CASH PRIZES

First Prize \$50.00 Second Prize 25.00 Third Prize 10.00 Fifteen Prizes of \$1.00 Each 15.00

First read every advertisement in the Money-Making Opportunities Section on pages 116 to 142. Pick out the one that Interests you most and then write a letter not exceeding 150 words telling us why you find the advertisement you have selected the most interesting.

Entries for the contest will close on May 1st. The prize winners and their letters will be published in the July Issue of POPULAR SCIENCE MONTHLY

> Address your lytter to Contest Editor

MONEY MAKING OPPORTL NUTTES POPULAR SCIENCE MONTHLY 250 Fourth Ave., New York

Do You Need a Self-Starter?

(Continues from page 1/d)

The ability to emphasize the ments of a product, to penuade, to convince, to be honest, strought (orward, and upright in short, all the tools that go to make not only a good salesman but also a briter ciliara and home maker are now my brother a for the rest of his afe.

Little wonder, mased, that I highly

esteem the N.S. T. A.

Acurer P Heaptricone Romney, West Ya.

I mun, who is in a position to know, tells us what he thinks of one of the "Money Making Opportunities." Perhaps so are one of the thousands be refera to in this letter.

Dear Editor

Under "Bostness Opportunities - Upotice an opportunity which thousands reed

1 Mard of Montreal, Canada offers t those who are seeking a better position a letter of appointion and matractions have to sell their services al for \$1.00.

As a impervisor, connected with one of the largest employment organ actions in America (The Wessern Flectric Combons Chicago) I know that many persons full to get a reply to their apparention because it is courty worded and does not sell their

There are many good correspondents who, like Mr. Al and, enald turn their and to into each by advertising their services in Post LAR Se ason, and there are many good people who could secure better positions by using the services of people like Mr. Allard.

I very interesting letter, that we are printing below, comes from a Preparatory School Instructor who has not only laught English to his pupils but also instructed them as to the ways and means of making money. This is what Mr. Lyon. ALCOHOL:

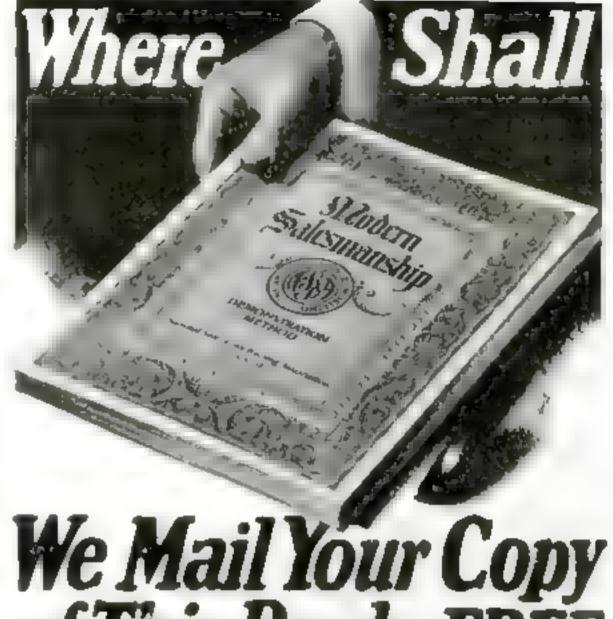
Contest Ecctor

Some of the advert sements in your Money-Making Opportunities Department if Populari Sensor Mostrux mor been of special interest to me. This is not sectionch here are I have made money by their myself. as because I save equilled at see to do so Loss seems to be the ironical lot of the trocher to tell others how to make money. hint Little?

As longlish instructor in a large preparatory. school in the beart of Fittsburgh's industrial and commercial district, I get a good many students of a decidedly mechanical turn of me I some of whom are work ag on useful investions. I have been able to call the attention of a number of these students to the advertmenter of a number of reliable tindent all officies. Buch, for example, as Carence A. O'Brien, page 143 of your

We have pienty of good patent attorneys in Pitteburgh but many of them handle the Lig local uses with correspondingly big fers, so I have found that some of my students hesitate to approach high-freattorneys with their patentable ideas for fear the ideas may not be received favorably, as unlikely to promise hig results. These are the students that I have been pleased to dieset to such reliable patent attorneys as Mr. Clarence A. D'Brien of Washington, GEORGE W LYON D C

of automored an page 118



of This Book-Fi

Remarkable new book on Salesmanship just off the press will be stailed to you without cost or obligation

THE contents of this amount new book men's Training Association—will prove a revelution to every man who is interested in making real money-and to those who realize the tremendous possibilities for high encourse in the selling field.

There thousand copies of this book will

be mailed free without cost or abugat in to those who send for it while the supply lasts.

FULLY EXPLAINS NATIONAL DEMONSTRATION METHOD

Thousands have wandered aby N 4 If it is done in agent to a see good, in a large way great for all start on a to ingle then had a contract out of such a participant of the large post place to I along with the ifference to be a seen as a place place to I along with the ifference to be a seen as a place to be a large place by the I along with the ifference to be a place place to be a large with the ifference to be a place place.

ner or winner System of Suice manustrip Training

EMPLOYERS

are invited to write to the Employment Dopt. of the 2t, S. T. A. No charge for this service to you or our members Emplayers are also cordially invited to request details about 1h . N. S. T A. Group Plan of Instruction for entire valve forces. Synopate and charte cent. without obligation.

TYPICAL EXAMPLES OF SUCCESS

When 4 11 Wand, Chicago, returned from the war be was note up 6.3 in week. He encourse with his 5 of 1 to a less pear opened \$13,500 and were elected an effect of Partin, Chirage J II Cook, things the parties of Partin, Chirage J II Cook, things the parties of Albana by street of week in most when he week with a result of the most report of week he was expense to 2 in week. It is the front Book for, Mann, of upol arts a \$10,000 position or Solid.

Manager on Diograph is his training, to will find bundlenes it sto flot surrese election in our all matages, purer step you can came a duplicate.

BIG DEMAND FOR TRAINED SALESMEN

Or y and deachine rates post tops are exercised as every time all outs the North American state of the North Ameri members and homeanic has seniord as as as the last the brought to senior the formula has and practicability at our Rise em of Rabanan-ship Tealang and Employment Service

JUST MAIL THE COUPON THE BOOK IS FREE

To fill to ago multi-the multime will not provide the may be a sign encourage of will pay you color the may be a sign encourage of will pay you color as acrost you the multiple and interesting back.

I'll so and mall be enquery and get is later the multipoper trading to the multipoper trading to the multipoper trading.



Notional Salasporn's Training Ass'n, Dept. E-15, N. S. T. A. Bidg., Chicago, III.

Walkout cost or obligation you may send for our feet and A other fate-matching and free Laplaymen

NAME 4 dd begin

Chleago, Illinois

Age

Decupation

OUICK SUCCESS THROUGH N. S. T. A TRAINING

Whether 3 to have had selling experience of not, unfertance The 's research shap Training will coable you to become a Abbeter waters of the off me majors, which person of the all sufficients year may be appare to a motion, and produce of a relies of the person of sufficient to supply a both to appear a building of the control of several and set of the under hel attendone ecetam was so still date been make to meet a a playert one too tet down on series, outsit competition, and make the pro-

fire in step this Tracking takes you through every plane of caseso making. Every underlying practiple of the exten error of in made as maple in A B C Through the N to mak is consistent on Method, you get on a superious on printingly ever type of sales problem the may ever present mell and through the theory of through the instruction in Character Appropriate had become an extent in resolving character on night a tranship aget for any salegona,

Your Own Little Shop

with a "LITTLE SAVAGE GRINDER"

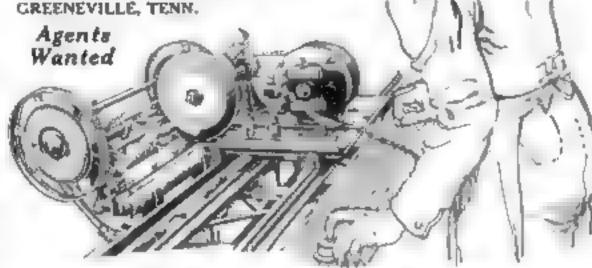
One Man \$ 1 Reports

Made Within a Few Weeks Under Our Wonderful New Big Profit Plan, Sent FREE!

BE YOUR OWN BOSS! Know the joy of manly independence BE FREE! Come and go as you picase SHARP-EN Lawn Mowers, Paper Cutter Knives, Planer Knives, Cutlery Skates Make Keys every household every store is your customer Permanent. pleasant easy business. And your own must little shop! Write today for our Big Profit Plan it a FREE Just ad-

Sure, Steady Quick, Easy Profits

BROWN MACHINERY CO.



COPY THIS SKETCH

Epit for the ere with a second depart in the antennity of triplated by the policies of energy of feeding about the period of executing front is able to be a seriod of the form of the first to be a seriod of the first to be a seri



The Einibersity of Chicago

Contract to English, Mistory, Chronistry Business, Martin matter, I linear son, Prochestory, and J5 story ashers a strength or contract (course) a Barbe or degree h and one for Address 25 Bins Hall, Lancounty of

A BETTER JOB NOW-FOR YOU

Earn \$2,000 to \$10,000 a Year!

Why work for at 1 roy? Learn a gion trade. Ke we autow done to repair them to a miner Sew! Or a surse of a room leading a few wooks here at higher a to trade we seed ath short of the act of later I e of the control of the transfer mechanic and anti-electrician and Eura Hig Money. Experience not accountry. If you are mechanically lamined come to Detroit now to the Old Rehable. Michigan State."

or on the wonderful advantages. Shown as in I was engaged gotto destinated by Assum book a purpose of light of at-Ш I Cash to Da par prit a Pa a b I E 2 during grad pasa di phara di phabasi 4 1 $\theta \in \mathbb{R}_+ | \overline{\mathbb{R}}_+$ T). 1.4. . . 11 4 T' we go as 450



The de us of tra led as o than is giply type un. when W to admy for his cotp de de ter a if migrous tu be must found?

Michigan State Automobile School IN Auto Bull ding Dutroll. Miridgan

GET THE FACTS TODAL

or my restored that og a

MICHIGAN STATE AUTOMOBILE SCHOOL 585 Voto Building, Detroit, Mich.

hance to be in-

Sent me lift if an antique shippy may implete after matternation for not through a make the most mone.

Cond Positions Open. Birr syour

Otreers or fill 1. L

City I am prepared to . Register to author Home Study purse. The ordered is not not as input entropy

Do You Need a Self-Starter?

from the group dailye for

Decide now what you want to be inlife. Read carefully all the advertisements an pages 116 to 142. Then fill to Lac. eschous or wate the advertisers you select as being most interesting. These advert sers are ready and walking to help you. The borkerts and other information they will send you will be extrement interesting and of great majortimes to your fatage

Complete List of PRIZE WINNERS In the March Contest

FIRST PRIZE \$50

Mrs. A Lundeen Forest Lake Minn. Coyne Electrical School

SECOND PRIZE \$25

Clarence M Minott, Bangor, Maine International Correspondence Schools

THIRD PRIZE \$10

A. P. Herdrichter, Romney W. Va National Saleamen's Training Amne

PRIZE WINNERS who receive \$1.00 each for their letters

Herold W. Levib Port Colline, Cole. Mohane Institute

G. H. Bennett M. Iwankee Win. A Allerd

P E Riving San America, Colif. Coyne Electrical Brhoof

James A. Mriton Dison, Ky. L terary Bureau

J D. Carvert London Ontatio, Cat. Stephenson Laboratury

Raci C Cooper Athena, Ohio Ame can Technical Buckey

L. A. W. Johnson, Arhland, W.s. (Frof. Henry Dickson

Frank G. Dav s. Herrisonburg, Va. W. L. Evens School of Certooning

Waltace Hamidton California Pa-National Radio Institute

George W. Lyon, Pittsburgh, Pa. Clarence A. D. Brien.

Coop Pughal, Tampe Pla. American School

Anna M. Dempsey Los Angeles, Ca'if Sherwin Cody School of English

Ė

3

H E. Howe Glencoe, Mann. North American Institute

N H Caskin, Marietta, Ohio International Converpondence Schools

E. L. Mathit Dekville lower Ciarence A. O Brien

Penn A rise Electricity pays W. R. Peters Allianty three user for this is year for the least too the

2700 im. "Thanks to you I made gist n 24 stars on Period.
24 Days says F G M Nobb 1 W. (64) St , Atlanta, Co.

extracherms

Productions with Lines.

BELL SAID STREET OFFICE To be 10 Mars 1 Mars 1

3 THEOTHE TIGHTHA BUT

4 FUELTRIC POWER BUTTON hable not believe 2 ANTHONOR OF PARTY AND ADDRESS OF THE PARTY A

MONDERFUL working

OUTFITS-



\$125 Depend on me as a booster Mark Frage mb 1 and Work Vestigement sturied me to societa."

Sooth Pay "I now make eight times what Introdes | ea ned | rPic | / | used \$4th. Carroll Moes, mer, Chaska, Minn,



Get Ready NOW for a Big Pay Job in Electricity—Be An

I Will Train You AT HOME In Your Spare Time

Don't you keep on working for only \$25 or \$35 a week. Get into Flectricity Thousands of Cooke Trained Men who knew nothing about It a short tube ago are now carning \$70 to \$700 a week as Liestrical Experies and they don't work half as hard as you do Why stark to your small pay job? Why stark to a line of work that offers no chance—no promotion—no big pay? Get into the world's greatest business. Factoristy needs you. I a show you have to do it. Get ready for the big pay job now.

Execution! Experts Are in hig December.

Even ordinary electric anti-the acrew draws: had any making big money, but for our money electrical hapers who get the top money are involved more now that even before. This paper is a fix do not remain the contract the contract that is a fixed or a second that is a fixed or a second to the contract that is a fixed or a second to the contract that is a fixed or a second to the contract to the contract

Age or Lock of Experience Bare No One
You don't need a private. You don't have to be a College man. You don't have in the even a high attend graduate. As there is a program of it is bug two matten delian tentificant which does a provent Consult by Expression as the college man to bug describe in destroit graduate Training Schools. I have just a set of paying from twent to make a bug described, completed as graduated from the college matter of a stage to destroit.

Employment

Employment
Service—No

My Training Pays For Itself

Tong dust about a britishing a stem mortely in first working stilling part and they find in the first part and they continue for dusting the property of the more part has being property and the part about the property of the part and the property of the part and the property of the part and the part and

Your Satisfaction Communication

I up to said the case make your box success to Electricis that he I have done or by men whom pictures you see before any a superior that I is governed to see any a technique based on any book for any other and the beginned to say, but parties a bread of the program with a beginned to say, but parties a bread of properties that the program of people back average barry people of the matter do tay has the program of the progr

Get Started New-Mail Compan

Get they big free band. "The Vita: Facts about Elec-trocity" Rend about the average of bardereds of effect men-ment win recommend the car a said whom homes and advanced of group is any band deed the form of a said whom homes and advanced of the property of the said of the form of a said of the said of the said from the said band and the car worked on the said of the said of the real spin time.



1. L. COOKE, Chief Engineer

This Big New Electrical Book PREE

The little Edition of my his book —
The Vitani acts about fract sets

In the little free promit top recipes
by W for your copy — in 2000 fr

Section for green of interfering his
tests of section of interfering
beauty you can do not be little free free
feedom; from it does not not be
feed to estimate glassician back. Here
for it leader.







Extra Charge

I will train you for a big

CHICAGO ENGINEERING WORKS. 2100 Lawrence Ave. Chicago, Minele

Send me at once, without obligation, your big illustrated book and complete details of your Home Study Course in Electronity, including your outfit and employment service offer.

The 'Cooke' Trained Man, is the Big Pay' Man!

Oppostanities for Beellars in

Quick Action Advertising

ADDING MACHINES

The Proposition of the Windows of a Soft a gentle of a most appropriate the Soft and the soft and the soft a Soft a Soft and the Soft a

ADVERTISING SERVICES

At the letter (m. a ten ped and a ten ped an

A by the world languation and temperate is at positionary to a transfer of the collection of the party and the collection of the collectio

for Non-Non-k

ACV P and in 26 ton standar Newson ere 10
worlds in a Box Hura Newson ere 10
worlds in a Box Hura Newson ere 10 world in the 10
Re 10 mersty newson ere 24 word in the 10
km of open and in the National Advert area
persons instrument if it, New York

AUTHURS AND MANUSCRIPTS

Piles 44 to man 3 y tomograf. Papername quinconsumy outline bree to an our before Producers Lengue, 3 y, 80 kinds. Published y Parena. 34 Times liquide Mantana, New York.

HOLNG Prote William stad on grower can. Ray

I WANT sour poems, Corput Kathan, J-2500 No. Pinelop, Chicago.

188 F. St. | 1 S. Printeple photo our delived oung been thethe what for forebackle or see k Larger attent a telemi 1995; Manta hamica di Wast gen A. e. Lar word Colif

G TOME BALLS AND ACCESSORIES.

the face above our set I need a chart set of the to be a set of the to be a set of the total and the set of the total and the set of the total and the total 41 22 10

Part of a star seem Author estimated contracted photomers, or New Manager of the Startest of t

1 1 A 1 HA teation (or First Makel T. Chassin with network right an able of the are a fire many a 1 accuracy of the real time of the 64, 800 M. Le Da. Consequent of the fire last a a

CONTRACTOR

APOPERATE A SERVICE BY THE BEST OF THE PROPERTY OF THE PROPERT

select a less says to be all the control of the

That the team of beat of the grandown a per-percentage to a story on the same and the same thousands the story of the same three same parts in the tribute around it is the tribute of a Calcade Physical

the go gots no fault model as opposed for Weine to

A lit. S. A. Let an Habitat can be a proposed from the second of the sec

At a start to act we of Call three & quater 1 de Frages for Plante seas and Sant strengt et a de Att Strengt sajet three square in the two strengt of Call adoptive Management of Spread of Sant Sant Paris Res Inter e

At a 1's substitute her thereof a sign of great of the second distance of the second distance in the second distan

BURKET AND LAUNCHER

AP 1 50 1 from sorth projecte has the operation and officer to the second of the secon

CANALITY your First Motor Into dependable marine r (dans) - on erestar during som dile per secti resterno appent adapter 1 (d) massimission bita No. All nurte for contretting issue of all area o hid to the entire motors are represented and the se-wertest material Ingan Aviation, 4 th Superior

Way his Representative to be every factory to the Cutted States Popular Science Monthly Lat Fourth Are. New York.

Rates M Cents a Word, A 10's discount to allowed use all contracts for all conmention investment. Advert coments intended for the Jures. 1926 terms chould be received by April 5th

BUILD PRINTS

with a bound of and of the World bere a suggested per continue to the property of a distribute of section and the section of the section at the section of the section at the section of the section at the section of t

BUSINESS OPPORTUNITIES

the first that the state of the

of a state of the state of the

the state of the s

and meets at raph of the his or 4 pales of t 4

of the fact of the product and advanced blanching the product of t

a replicate to the state of the carbon to and the state of the carbon to an analysis of the carbon o

of Inter-Charles The wellship was on other many through in morth the many through a fine and the second of the second

Philipset for a \$1 to teach for \$ (0) data of the control of the c In Is

properties of porting properties of the properti

he but were the ment by a bushelphan

to be regal to a factor of a factor or an arrange to traces of the process of the factor of the fact

extens notes you up that of event distinction a letters to I have a to be total order features. Plet

the state of the s A miles are a

Par in Early a committee in the committee of the committe at her ware careful to drap)

1 7 8 1 I verticus (this are Biolines has I as wen

spiker from her p. Wharten to help grand's

thus area Dept H. Paul Kare 49 I randam New

tilly the see He Branefull independent with that all williams on marker. Marken, addings

The same are a present and I send becard number of

The state of the s hi like the resilienced at tome I als less beening

I am after the letter and your 1 Tell by Sicke than pullers a series Institution 1 Salter the telephone pullers a series Institution to take the first telephone pullers a series Institution to the

the contract on pure Thermal Labrance (0.17 All is a do a for the out. Id it is easy The Libert T Main screen diembe. He filtes

adding the devote of the cape in the free Kerr &

BUSINESS SERVICES

errest er til en forman i demand en alle for territoring on

Night Firm \$1. M where will broke bette part to all the \$1. Me to be at which part is a great to be at the part of a great to be at the part of a great of a great to be at the part of the

CHALK TALKS

Carte Strate No. No.

DISTRICT MANAGERS AND REPRESENTATIVES WANTED

All the factors and seeking as a percentage of the property of

LHOIG-9

the difference of a new proof better the state of the sta

#DUTATION AND INSTRUCTION

to the term toward requiring upon credity at fourth with the professional fourth to the first that seems fourth the opening the contract to th

Wat it is not been be worsplete Trubes 440

e er bine scope. Sind Course, Writer Courseship or > II

his it to be a popular applicate the first of the property of t

FINANCING AND INVESTMENTS

FOREITA Stands moran ducta and currencies. All not a light blood of a special found of the former former former for the former in the Contral Arthur to the terfe tottle period in dependent contral Arthur tottle fin to the first Arthur

SURP ACCEASORIES

(A Millian of sallon have at a particular of the help Mar A. British . # H M

d did hat off to use mineral life hop have a strong to the strong to the

PERIODIC STREET

b [g'-11'] and b. I be' the arbiting of Server Land as referred Coupe to the Bridge of close and the arbiting of the property of the property

which is a transfer to a market transmittered to a training and a processing waterproof, substitute training a second of the processing foundations. Price 54 00 much a resenting to be \$100 much a resenting \$100 m s of the transformation of the transformatio

Franklin manas (a Marcadas con alei Topi man per passa a la contrata de la contrata amenda e la manas de la contrata del contrata de la contrata del contrata de la contrata del contrata de la contrata de la contrata del contrata de la contrata del contrata A S protection I Month Wort 1 5.50 Marts Norfolk Nor

dictorial a May the latest of the latest o unben Tor ronfellos Lecas

POR HOYS

As he had been the Market of a new others we make he was the market of the had been and the head of the second them had been another than the second them as the second them had been another than the second them. Market been another than the second them the second than t

FOR INVENTORS

The find on owner contains with methods in the street of the parties of the street of

Will a Adam a lefter Mill to 1811 oright for INVESTIGATION

FOR INVENTORS

Mrt DEER Builty Invention Developed, Well equip-ped I specimental adapt Pervice Loss Works, Inc. Indianage 4

Institution of the in institution of the personnal and her hard I then whether on 12

I have remain an acceptant legislation of the personnal and the form of the same part of the personnal acceptance beginning to the personnal acceptance to the personnal

Punget Vale of the parighted Was as In-tent were not in diginal With the diginal beautiful passes from the construction of the process for the fit of the norm of the norm of the passes of the construction of the at a term of the totally to the state of the determine for a sure we are an arrive to the present of the total total a position of a form a least of the state of

FOR MEN AND WOMEN

Here's Value Work home of a low war three course of a common value of the same value of the course of the page 14 of the large. The Electro Threshop Company 1837 Mala Herest Structure the Otto

FOR SALE

his was the state of the state

Here the mile I be to be proposed a 7' half-

FOR THE HOSEL

HAT WAT ICAN AP BY MINE ON OTHER BOOKS WITH A STATE OF THE STATE OF TH

HELP WANTED

M. A. (1) S. A. S. or a leastery state of transcent, from proper parties of the Physics from Money M. (1) the Money A. C. or and A. Or

NICE of a large stage success of Society of the particle ground on the Nov. We are not being Nove that a Resident Key Society and the stage of the s

Negligible of salar and the salar to the salar salar and a salar salar and the salar s

THEFF WASTED INSTRUCTORS

Is the expect to a pilling Minters. It is been copyrist to a second of particular land of the proper discover interests to a second of the particular land of the proper discover interests to a second of the particular particular and particular and particular land of the part

The major of fivers against the second thank he'd head of the major of the five state of the second to the second the second to the second to

HOW TO ENTEREMENT

If \$5.50 quadrus expression and or upon out a cot or a let him before and a subtraction of the cot of out of the cot of t

INCOMPURSTIONS

AN FRANCE FROM DESCRIPTION OF PERSONS IN THE PERSON OF THE

INFORMATION

Aless commercial and all the distance of the second of the and then Commander that the er troffperie are Pet 111 40.1

At all 5 a separate 5 that it is at a 1 45 Nil order of the property of the pr

INVESTIGATION

With not spend spring Sum is and failing that his series uses a large indicate of a picture of the series shows a series of the series of the

INVENTIONS WANTED

WILL buy approved layers on Write-W. L. Ken-LABORATORY AND CHESLICAL SERVICES

1 H if them may problem softed and with problem formation to the Wilderman Microsoft Control of Microsoft Control



Yes, sir, nine out of ten men, mechanically inclined, want to cash in on their training an light a good job right away. Sweeney trained men have found the right way, the easy way to good jobs, secure employment, or of owning their own business. Sweeney Auto Training makes you independent and successful Just the minute you graduate from the Million Dollar Sweeney School my employment department works to place you where you want to live. This department has nothing else to do but to place byceney trained men in fine jobs. Last month we placed graduates at from \$35,00 to \$50,00 a week in Natchez, Miss; Springfield, Mo; Cape Girardeau, Mo; South Bend, Ind. Chevenne Wells, Colo ; Tyrone, N. Mex., Hattiesburg, Miss. Shipshewan, Ind., Brookston, Ind; Marengo, Ia; and a large number of jobs in Kansas City, Mo., with Hudson Brace Motor Co., Kelley Reppert Motor Co., and various garages and auto agencies

Get the Best Training

The Sweenes Auto School offers you the greatest opportion a concern had. A sig-Huikhing-10 stories high-over 12 acres of floor space to oted in the Sweenes Sixtetem of Pract a Joseph non-inner expert in tructure less notes the place from the Union Station, short distance from beautito new Two Million Dollar Memorial building. Recreation after work; swimming poor, or or ax on , band and or hestra, Rach II so as ag Sta WBB R mare ber TBI 84 S ONLY ONE SWE NIA AT TO SCHOOL CALL ONE "SWIELE At 1 S1STEM and you can only go this system at Kansas City Mil

Learn a Good Trade

One that will pay you \$200 to \$500 a month an more that in he aggs cosmess in the world—the Automotive Business. more money to 1926 their you ever freamed procedure. I want to prove has a scream for with their incompany past in a crowned ten by done as a resort of SWEENEY BUSINESS NOW Learn it at SWEE-NEYS Kansas € 27, Mo.

My FREE Book Tells You-

How to run a garhair amamberer Har to blace mystal great triales. blaw to travel stell see the world

How to By remodel? for prospertie Her to get a good men trout all wh How to learn to be

a chauffrut or truch lies to learn to repair any make of

cor these to weld, these to learn bal-terior and no or rea become inconsiderate Spens from cens 16 also me the succession prome no principal le to terra

JOBS PAY \$50 a Week

COME RIGHT NOW IF you take more but in by no most it sat the to work on that Supported South the Support of the S givened a bay payer of as the teaming DAY 3 PTY NO WE NO YET cor mag, battery work, e-

trical work, avastion, building and repairing Radio sets. No experience or education needed. No books are used. You work on most combacte gas engine and electrical equipment in any school in the world. Over \$200,000 invested, \$50,000 Radio Station WHS. You'll get dirty and greasy, but you'll learn by the "Sweeney System ' that 61s you for big pity jobs at \$50 n week and up, waiting for Sweeney trained men

Sweeney System of Practical Instruction

There's mly one ,dace while an along t thes teaming its at the war resour-Sweeney Automotive and the free School of Kansas City. There you your Sweeney School. There you you also are Sweeney Story other school offers or can give you this training that not only trains you to fill bug paying jobs but saves you time and money. This training is making big money for 70,000 Sweeney M. M. Marco Della pickor III.

Charton Control III.

Charton Contr Graduates, Lestimate

good paymut buti.

20 000 of them own a

CATALOG AND SPECIAL OFFER

Cost my hig FREE 64-page rata og 11 shows higielfreda of actual photos to the prior there have been present from their and the base of the advantage of the payon to be a sufficient to the payon to the payon to the payon the payon the payon to th

the state of the s studenta accepted

E. J. SWEENEY, President



RMORY J. SWEENEY Provident 2509 Sweeney Bidg., Kanssa City, Mc.

Please and me your Pres 64-page cut - or - or in-

A PANSAS CITY

Ad ten

Two

LABORATORY AND CHEMICAL SERVICES

Meridia and Adapt with 1991 to MILET in agent by the hards by the forester to a St. with the field of the same

and technicis Proteons It as 2 str. p Old I was brokenich F mirrari Physics of the Straight of Salvanian at a few Straight of Salvanian at Salv

DOMESTICS.

The bill of the Street Space of Language S

INTERNATIONAL SECTIONS

J et milita 7 9 Br 2 Br 2 1

THEORY OF THE EXTLISES.

N D D T I I IN F I WAT Brown with Fores, we plant or blefts. I from dendering Worlden my life

Tell on your or bloom or tree stands and Worland, my big as weather or the stands of the Residence of the Stands o

MALINEME TOOM O

of the Park Manufacture and Andrews and An Indiana in the

MAGH TREETS

North a Director of the Section of the plant of them date.

If Mingle a few and the first present the second stage of the present the second secon 4 146

MAIL OR ON BUY SING

\$27000 E Mail the speech home. It shirt has started the started the started to th

MANUAL PARTY BANK

THE ST. OF ST. Marks and man a single special of minimum in the second of the second o

MINUTALISMOUN

Alton. Now Heat at the Park of Their as a Alton. Now Heat at the bricklet free

Makes driving sate and pleasant. Price resignable rimple and effective. Write Alvin Colassians, R.F.L. No. 2, Union Ave. Remove Be N. J.

Marine State of the state of th The street of the second section of the section of Militaria minipany

MODIEGO AND MODIES, SUPPLIES

the same of the sa

d, who make the same from the contract of

NP | 6 | Marrier or terminal property of the p mer a tripe manera mers wish his long of mer has transported and

At he as point at adjustment of the presidence of the president of the pre

MICE OF THE EXCENT OF THE STREET, AS PROJECT

to be presented to the second of a few property of the second of the sec But g Vi sa

H No I have a place or be transfer. It is a finished in control or projection which is being a control or projection. By a

MORDING ENGINEES, MOURINERY

Hilling to price to the price of the property of the price of the pric

all the property of the property of the control of MINISE

ber Pugan I have her (hords bires)

OPEN AL COURSE

SRT25 A rich fraction time (maker agent

OFFICE DEVICES

a had a sed by hisof an at from 1 2 M 1 " Seed

OLD MONEY WANTED

Treatment of the state of the s I was be so haliged in higher blooms of the part half ha Company Problem to much Department Letting

PATENT ATTORNEYS

to castructions or trains a REE book, "Hours of 1 1 1 4) where a comment Begintered Parent Attornes. w) Washing officerly serves street from the). Washing rec. 22 (New pade 227)

-- 44 4 the tailor of the same and the training of the same and t

treatment of the state of the s man and a property of the he to be desired to be led for the second the season as before part of the second of the seco

PATE TO Link marks No a list of the last of the l

Property of the Property of States

AND A Be made I so as sequent of our planting legs between and and in a street of our planting legs and and a sequent of the sequence of the s

ы a group of the state of the sta the house of the same Fit In I admitted the Committee of the C 100 for a Second Patrol Stin me

of many

U > 1.54 And the property of the same of FEE T TO AL

---of figure to an of space and a second form to be a finished as a second formation or a market field.

the the of Take Mark to be the first to prove the province of the of the state of the first to the first to the first to the first to the province of the state of the first to the first t

HICHARD E Bahruck Patent Las - W. Louis & Trust Hidg., Workington D : 1.

5" 10" 5 " 1 7 2 - P 4 P PA A T IS FA

FENNS NO P Part of the second of the seco

Pilot M weetin 45th 51 per 11 5

انظر ال The state of the s 4.37

the state of the s d'age

UNEXCELLED Gloss Prints Trial (**) -

THREE 3s7 hotsogements one deflar Prompt

PRINTED INTERNETING

Jan 9 to 1 to 1 Bank I would be had not be to the order to be placed by the state of the order to company the state of the beautiful to company.

Est To the long to Love Maries Winter an about form pints on the set of the s

PRINTING, ENG. AND MUST

of the base and the second was See all

REPORT OND BESIDES.

production of the second N. P. Ma arma 10-0power has been brought up a

SALESMEN AND AGENTS WANTED

ACRESTA Write for the on about out Martines, Netter-Marie Storage for when the second to the formation of the second to the formation,

pris many for the state of P to cod 14 TAN E TY 15 4 to to 4 to 7 pt 6 at 10 to 5 to 5 Set a fright Militar 111 Tor Note Series .

and Maria And the be to the the stripe for a group of the Appendix to the test of the te

* * 1 TRING ACCIONA, PETRINIA SAND proditable, i.a Derma Co., —ari

The following hitter or minimal of the series of th Want beat

to the transfer of the state of

Lated appropriate to the transfer profits of the transfer profits and the transfer profits. Metales to the transfer profits of the transfer profits of

H A - - pre-PH-+0 1 44 1 4 No Popular to with Ministry All \$100 15

to all the first endants to all the second to the second t at appear of the second

the state of the s The state of the state of

Part Color on Pola allando in a Color pro-

to be to the process that make appared to be seen the

All the fell dear hear And the state of the state of the state of h 14

the set of EC No. 5 Page 1 has ed priority.

event ment of our coad, as references and the entering of the serventure from to make hig money and free sample at

The state of the property of the state of the party of th

61

W. In all tory hi los, the X I pigham Res B of t Man

to the term of the contract protes according to the contract of the contract o

and the second of the second o

Bright to age on a big M. See Historia Lad ton to the art A NEW ME

Prof. of the second of the sec

TANK Chieffel Post Card from You brings free would get all of the st the same or for or on experts Rombied torse to the state at the passion of the

FTMIN' Discrepable thannes a mage but enter-liming to smarth each and to discrete be environment on the sold with the chance of their up fortune we say the sold with the for the covaliars. Murphy Chantele Tulmara Cabi, Post K.

As the control of the

No dept make welling heart. Prople must est. Federica the enterior make high more \$1,000 yearly and up. No experience we less generalized rules draudd prode that we have been set to be bright with Berner. I have \$20.00 sets into acide next on track. Fithis have been est on track. Archer hillinger Aste that we developed the property of the and it is

est a 1 a W. H. Come temp If a plan Make terms the old h expedient increase lifetime in recta Month in the distribution containing tree to be a Washington ture I

44 Miller of hopfor the growing search de-tackers A septim base depositely of the transmission of the constant

A stee op reality will the Apparent of the Order of the District of the Order of the State of the Apparent of the Order of the State of the Order of the State of the Order of

As P.S. Per, W.A.N.T.K. is charge labour point. It desires melts entitle. At place a square about destroates a tors of a wind of states in the place of the state of the state

Other than the test of the test of the second and t

Fig. 3. A advenger binerary configuration. Subages the goal on the same of the famous of the back of function from the segment that business of the all or transport and eter ob Co. Puns, Music

At It Burth dept Mindler White an discretization of the property of the control o

No War and applicately in the A. 10 to make where A. 40 each mentiong for the large and the darks at the property of the A. 1 to be building to the A. 1 to be a second of the A. 1 to

the PH D. I talk within breath made reach a net-pellation of adds the best appropriate of a ship is free Specific and Specific to this (Canadian). Non-

se if by MAIL! his all boxs become Note of the an artifest P. T.

Still A to this sit was tooks but a costs of the firstly be into the surface of the firstly of the firstly of the firstly of the first and the firstly of th

He is bright to hipsing offing of an in factories I has be not specified to the product of the street of the stree

All A Single test many or it netting the shipe table is a more end of many in the property of a more fine and thousand in the first many the same with the first test many the same fine test many the same fine test many the same fine test many tes

I liden.in.

A STS STANDING THE ASSESSMENT OF THE PROPERTY OF THE PROPERTY

And the first properties are an enterior by many de-pt to a phase distribution over the fact that we have the many and allowed fitting to the course of the says. It

b) I N PS input of the day of cities. Money New equipments the prill a Ps Proof as Service With tempts. Notice. Particulars for

A Position is not often better the control of the later of the control of the con

A wife the six house is not to be unstabled the state of the six o mires | Dir

A E S of the tree of any algebraic district a minute, expeditions. Moreon a second algebraic at the second algebraic and the second algebraic and the second algebraic and the second at the second at

A PAN A Proce to Algebra of representing of the action. Takes order a digital housest different to weather and incomes. Permanny We a good Paumers where A O Co 3/4 Co 3/4



HIGHWAYS TO SUCCESS!

job at big pay when they graduate.

The big money to Drulling goes to men who speciallies In Machine Design, or Electrical Drafting, or Architectural Drasting, or Structural, or Automotive. It isn't must know how to calculate and design and plan original work, you need many Engineering subjects to fill the kind of a Drafting

position that pays \$60 to \$423 g work. The Amer-

ican School new anclades the special-Drafting course.

Professional

Outfit Given

Job Service Free to Students

and Graduates: Test American his sterients and graduates, without co. t, the tervices of an election I approximent Department which keeps in touch with the employers of Draitsmen all over the United States His have placed hundreds of men in good Drufting peritions. We have made this training so complete, so practical, so casy to maxter that our students are bound to make

good And so, because the demand for real Deaftsmen continues to exceed the supply and because this training actually prenates men for good Drafting positions, we by it is with a Free Employment Service, free to employers, students, graduates.

Chief Drafting Ergineer

American School Dept. D-575 Chicago, Ill.

COUPON

123

Brings 3 Lessons Free

Get them. Test your own ability to learn Drafting and get ready for a line job and big pay. Coupon also brings surprise offer, and complete information about your opportunities for success in Drafting, MAIL IT TODAY!

> Ohlef Overling Engineer AMERICAN SCHOOL Bressi Avs. & SHtt M., Ohloags

Rosh 5 Pres Draf in Lament, surprise offer comblete the form on money lock guarantee sic, to prove I can be one a real Draftaman at SHORT BURNETH CHAIR.

и	Name.	
Ξ		
•	Object No.	



UseThis Amazing



Ill Guarantee To Keep You in Razor Blades for Life

Rensational New Invention Guarantees You 345 Slick Shaves a Year-No Mure Blades to Buy!

KRISS-KRUSS marks such a soluted selection of any abaving comfort and season. has a director

to be called much made thus a a save faute to be called much made thus a a save faute to be a blade rejuve nature. Afair a prompt is a faute of the called a made of the diagrams of the a faute of the diagrams of the analysis of the analys titels in react with the because cutting edge

ted now or as annualing offer the 30 days on a serie now land of many for a language and many for the language of the form be made etranglij or Zediape is a diffy Five special blades free, too.

Construction and the most have the form Angle of the ser II may only be an in the ser in the ser in the prompt that it may be a ser in the ser in the



Write for Details At Once!

This ast suishing offer to limited. Mend for of we Person on anading Krise-Krose Inventions today. se ras kable than I can tell you here. Clip the roupon today. No obligation

AGENTS

Make bug in such as a K has become represent at a 12 first a such F got days a case a plant but a go a front of W has a good at a go a plant but a go a front of the first but a go a go by a first of the first but a go a go by a first but a got a go by a good and a good list to day

Space to be numbered office and factors men make.

I have a a day pass show a locally see in
e man. See in the end for defining Church hittoria. The state of the second of the state of the state of the second of the s

RHODES MFG. CO. Die E-241

Rhodes Mig Co. Dept. E 244 Prodicton & Cuscus Arts. St. Louis Mo.

These exist me without obtains an details of our offer to keep me in Hanne Discounter life. Along tall description of from cases and accompany

4 (5d) needs

SALESMEN AND AGENTS WANTED

In 7 sell for even the sage may prefer Make your was process to be a sell or or or to be the performed or a manufacture of the sell of the

VIVE mile come was reasons. Visite up to 5 we detailed the same to a distance up to a few from Francisco and the few from Francisco and the few from Francisco and the few franc City In City

the excitation with a final tree is because the second to the second tree is the second t

here ghe a summer or as gen or less or his action for the property of the prop

of the state of th

the analysis in a second to prove of the first and the proving of the first and the province of the first and the province of the first and th

Direct as gate of the first term of the state of the stat

the shift he assert here is a first held open of the arms the shift we are great three marks to prove the shift we are the shift with shift with the shift with t

Cable I we needless brown near active phrame ready from the service of the phrame ready from the service of the phrame ready for the service of the service

The proof of the p

A to de to d

Approximate the second of the 120

to a state of the same to the same of the same to the same of the

The Property of the Property o

pro b to a set of the person of a set of the set of the

to a " to the service we manufacture and a total of the for the part of the first term of the part of the first term of the part of the pa

SALESMEN AND AGENTS WANTED

A Hills in product of a bronze was top to an few and to a star few

The series of the real flow of the lives of the series of

The sale of the sale of the first of the sale of the s

the second secon

where the state of the state of

10 to 1 The month of 1 to 11 to a control of the state of

dallandan ter largest New Regions Found out t improved gat in far one to weather Largest constitution of the control of the square to be a provided the following

The second of the first age of a Table related for elementary to the first age of a Table related for elementary to the first age of the first

The second of the state to the second of the

1 to 5 55 second field frage 4 F (button 511

4 II - par - 10 tol - 00 MS - 8 s for - 10 M s - 10 Darbier II of - 10 He - 6 sate - 6 bit op - 10 Darbier II of 4 1.1.

The left of the later of the la

The state of the s

a s b s a m mod t tige meaning or full For to H, Fr.

and the state of t

Programme and the second secon A PEA 2 Million for the second of the second

The state of the s

n in the state of the particular of the particul

to a more reported than long,

The property of the property o tel at tra p

THE RESERVE THE PROPERTY OF TH Tabanda ale con el blocce

The state of howest prices should be price that before buring che-where We may you makey Modifie Supply British, Long Prepared, N. J.

WANTED

the first section of the section of

Remodeling an Old House

(Continued from page 50)

wall is a more difficult and arduous task. Most floors that have been subject to wear for twenty or more years usually need renewal. They are probably of amgle thickness. The wide oak boards of the antique house show knotty high points, cracks and warping. Later floors are open jointed and splintery. Whatever it he, the old surface may be left for a subfloor. After nating down loose board. edges and removing excessive irregularities, cover with one or two layers of building paper, and apply new flooring, preferably quartersawed stock in narrow widths of oak, maple or yellow pine. Then you will have a substantial, warm and creakless floor that will last many

OUR ancestors built their cestage low because with the madequate heating system of log fires they had to conserve warmth. To mereuse the height of first floor ceilings, we may ruse the house above sta franciations and lower the floor. If the foundations are high, the floor may be let down without jacking up the building, and the cedar can be deep-eased to make up for the loss. The floor joints that are lowered may be attached in the walls with metal bangers or they can rest on a masoury edge adred to the foundations. With this method there rony he some exposure of foundation wails within the living quarters, but these may be covered with from and regarded as a baseboard, or enough material may be added to the upper part of the interior wall to equalize the difference. On the outside, the exterior house covering may be extended to cover the section of foundation used as upper walt.

I I the ceilings of both first and second floors are to be lifted, perhaps enough space can be taken from the attic; which, of course, will give angled ceshings to the second floor. Another method is to raise or extend the roof upward. The illustration at the top of page 29 shows how a new roof can be built over an old one while the family continues to live in the house. It is a novel scheme, original with the owner. W. Will ams, and seems to be a good one, for bendes affording shelter to the occupants it protects the interior during the remodeling period. In a any season or climate, the job could be done more quickly and economically by demolishing the old roof first.

Sometimes a spacious ceiling for a living room is obtained by sacribeing the part of the second floor immediately above. Almost any height can be realized in this manner. While a very high ceiling always looks well and affords arry cooniess in summer, it may not be a good thing in winter from the heating standpoint. I know of a case where the living room reaches the total interior height of the dwelling. It is handsome enough, but almost unusable in winter.

More windows or larger ones are needed by houses according to their antiquity. For this job, we should first obtain the new window frames and figure the space they will occupy. I onlined on page 12



\$100 in Cash Prizes

Common Education Sufficient
Many other positions for men-bays 14 up #

See Page 4 in front of book for details



Address

DIVENTION

141. 45%

the other sections

FION TO GET

YOUR DATENT

QANDOLPH & CO.

MAKE WATER

PROTECT NVENTORS YOUR IDEAS

C-17

Before disclosing your invention send for our Evidence

of Invention Blank. This should be signed and witnessed and returned to us with a model or sketch and a description of your invention for our Inspection and Instructions which are free.

Also send for

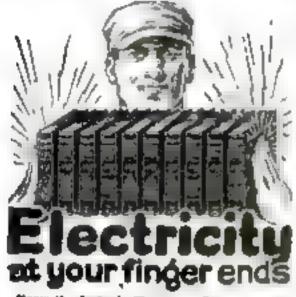
Our guide book "How to Get Your Patent" which is sent free upon request. This book includes full instructions regarding U.S. Patents, Trade Marks, our Terms, Methods, etc.

WRITE TODAY

Terms Reasonable Best References

RANDOLPH & CO. Dept. 130, Washington, D. C. RANDOLPH & COMPANY Washington, D C Dept 130. Proofe would and FREE OF CHARGE your Evidence of Invention blank and your guide How to Ger Your Patent" Name Accest.

3cate.



Home the facts in Electricity They came more tell, you all you need to know about Placture you have been presented to know about Placture you all you need to know about Placture you have tend of the present of your can their related to the tend of the your parts, pray real working rourse, in 10 volumes make a managed on a posted case; Santhia severy. Under a mit to-day to look ower.

HAWKINS GUIDES

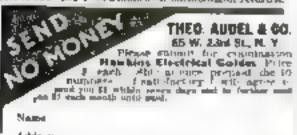
3500 PAGES 4700 PICTURES

\$1 A VOLUME \$1 A MONTH

These books tell you all about — Magnetian - Induction - Esperance 1) resemble - Electric Machinery Marine Armstyres Artestant - Ministry Marine Armstyres Artestant Windings touristing of treatment Electrical Induced Properties and Matter Mariners Mar

SHIPPED TO YOU

Not a cent to pay outil you see the basis. No obligation to buy indeed you are included, Fund Louisian new indeed and provide from the provided pay for it is not worth \$100 to too-pay \$1.00 a much for an months or return at



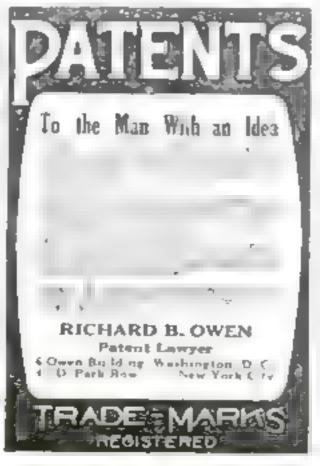
Address

Correspontines

Employed by

5134





Remodeling an Old House

Considered from page 12.

plus doubled two by fours on every side. Of course at least one of the wall studs already in place will represent part of the frame support. Mark the m. mated area on the wall and saw out the material, A prighbor of nune used this method successfully. When he came to nails he used a hacksum. This operation naturally applies to wooden construction. Putting new windows in a stone or brick house verges on engineering.

To make a few good-sized rooms out of several cubby-holes presents no difficulty unless partitions which support structural weight must be shifted.

A good many persons with enthusiann and more or less skill with tools do their own house revamping. Often they accomplish it in spare time from regular jobs, tesing rights as well as holidays. By thus being your own contractor and carpenter, you can save a few hundred and perhaps even a few thousand dollars.

Helium May Not Be Inert

THE formation of an apparently stable combination of helium and mercury was recently apposited by J. J. Manley, chemist of Oxford, England. According to his statement, the combination brought about electric discharges, and, considered a helid of mercury in perfectly atable under normal conditions and is enoty absorbed by charcoal at a lemperature of 310 F. The combination is split up rate. its components at a comparatively high

This autouncement completely appets the prevailing theory of atomic structures He one argue krypton genon and neon ferm **в g**e-up of e именія known за еђель istry as noble or mert gases, because they combine perther with one migher not with any other known element. This distribution to exabine was peropeted for by their atomic structure in accordnote with the generally accepted atomic

temperature.

If further research should verify these statements, it would prove that belium is not an meri gas and world three into confusion many important fundamentals of the present atomic theory

What Our Readers Say

A spounded magazine. Keep up the good work! More power to you!-G C S Mentown, Pa.

I take pleasure in returning check sent me for the Picture Contest. Please enter my subscription to your important marazae, which I enjoy very much. I won's eather stop eating of I had to save proper that way to pay for it) than be without st' 1. H. Santiago, Chile, South America.

POPULAR SCIENCE MONTHLY IS apprecuted by the employees here on my ranch more than any other publication. that course here J II C Agate, Non.

As a reader of your magazine. I wish to congratulate you upon the article, "Just What Tools Do You Need? ' in the March issue In my own estimation, a magazine which contains anything on tools contains something worth-while. K. McK., Alba, Tex.



Take the First Step Today-ACTION

If you have a useful practical novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U.S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea seven though the inventors may live in different sections of the country and be entirely unknown to one another. In such a case the burden of proof mats upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon below.

No Charge for Information on How to Proceed

The booklet shows here contains valuable information relating to patent procedure that every inventor should have. And with it I will also send you my "Record of Invention" form, on which you can sketch your idea and astablish its date before a witness. Such evidence may later prove valuable to you Simply mail the coupon and I will send you the booklet and the Record of Invention." form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

Prompt—Careful Efficient Service

Thu large, experienced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, infest and best ways in proparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

Clarence A. O'Brien

Registered Patent Attorney

Member of Bar of Supreme Court of the United States, Court of Appeals District of Columbia; Supreme Court District of Columbia; United States Court of Claims

Practice equipped exclusively to Princis, Trademarks, and Copyrights

Strict Secrecy Preserved—Write Me in Confidence

All communications sketches, drawings, etc., are held in structest confidence in strong steel, freproof files, which are accessible only to enthorized members of my staff. Feel free to write me fully and frankly. Your case will have my personal attention. It is probable that I can help you. Highest references, But FIRST -chip the coupum and get my free book. Do THAT right now

RECORD

INVENTION

BLANK

Mail this Coupon NOW

CLARENCE A. O'BRIEN

Registered Patent Attorney,

8897 Security Serings & Commercial Bank Bidg., Washington, D. C.

Please send me your free book. "How to Obtain a Patent" and your Record of Invention" form without any cost or obligation on my part.

Name

Address

(Importunt: Print or Write name clearly),

PATENTS

TRADE-MARKS DESIGNS FORFIGN PATENTS

MUNN & CO.

PATENT ATTORNEYS

Assertand they 1846 with the Scientific American

683 WOOLWORTH BUILDING New York City

1311 TOWER BUILDING Charage, Ill.

322 SCIENTIFIC AMERICAN BLDG. Washington, D. C.

> 664 HOBART BUILDING San Prantism, Cal.

519 VAN NUYS BUILDING Las Augeles, Cal.

Books and Information on Patents and Trade Marks By Request, Associates in All Foreign Countries.



Provil

Made their in three-

Marke St. Markey Propose Harris Ingele (12 at a tribute toget (12 at a tribute toget) Harris toget (12 at a tribute toget)

FREE

BOOK

"\$200 a Week

in this Outdoor Occupation"

Men-Women get out of stoffy offices, stores and fune-fi. sed factories.

I did and I now earn \$200 a weekannilen, belatetiperal let. If you want to searn the secret of my success and use my amazingly resultful system, mail conpou at seco for a free copy of a new book "How to Become a Real Estate Specialms."

It shows you how to get steeted right at home—in your space this without capital or ex-partment how you can bond up a profitable, independent business of your own, and make more money than you ever befure thought possible.

Director, American Business Builders, Inc.

Dept. 34-B 16 E. 18th St., N. Y. ______

Director American Business Safeters, hop-(Authorized Country \$500,006 td) Dept.36-4, 18 Sant alth Street, New York

Address

Send not a free cupy of your new heat 'How to Become a fami Detate Specialist,

Mang.

PATENTS

PROMPTHESS ASSURED

Soul drawing or model for exemination and report as in potentialship WATSON E. COLEMAN, Patent Lawren 664 to Storet N. W. Washington D. C.

PATENTS

Trade-marks, Copyrights, Patent Litigation. Handbook with Distrations, 100 mechanical movements. Sent free on request,

ALBERT E. DIETERICH

Formardy agentier Exam using Corp. C. 9, Patent Office.
Patent. Lawyer and industrial

Washington, D. C. 601-A Oursey Bldg



DON'T LOSE YOUR RIGHTS TO PATENT PROTECTION

Before diveloping your invention to anyone and for blank from "EVIDENCE OF CON-CEPTION" to be agreed and automored. A sample form tope beg with printed instructions as fisher your there to work up your desce and entails to began an before from ap-plication for patent. As it is found in many that force a we represent hundreds of intent call over the timber States and Canadam the an rancement of aventures. Our schedule of feet as the found reasonable. The form Evidence of Concepting, 'sample, fortract and twist or to obtain my of patents and schedule of feet sent upon request. Ask for them, -a particle. will do



274 Oursy Bldg. WASHINGTON, D. C. and the "Evidence of Course

Americans Plan World's Largest Airship

Cantinged from page 351

exactly, ' said Dr. Arostein, 'that a slopof this size can be designed to meet any constituents. In planning the 6%1, we have taken into account every possible e infragency

"Even suppose we count on the dashing of the ship against a musicioni, we know that the only matry would be a alght bending of the garders. The beliam cells within could not be damaged. And even if that were possible, we know that such a ship would operate efficiently with

two cetts empty "

Dr. Arnstein told me that the GZ-1 will carry easily 100 passengers in add tion to a dozen tons of freight and haggage and from three to six tons of mail. It will be fitted out like the finest ocean liners, with passenger calous, staterooms, bathrooms metoding showers, and during rooms. It will have promenades running the length of the ship on both sides, with windows from which beasengers may view the world below.

FROM his description I could picture this Levisthan of the art at a pol far. this Levisthan-of-the-air at a not far distant time suching high over the sea as a connuer sal ship, speed ng past the swiftest of ocean liners below, carrying passengers in luxury from New York to London in two days, and making the round trip to Europe and back in a week or ter-

I could visualize this name gigantic or liner on a worst crube, picking up fuel and supplies from a mother slop in the Philippenes, or tying up to a mooring most somewhere in Farope,

And when I left America's Zeppelin plant, with its busy group of skilled and determined men, it was with a fee mg of renewed confidence in the fature of alops that are lighter that air. Perhaps it is much the same feeling that is back of the discussion in Congress of an appropriation for two 6.000c000seafact deepts naughts of the sor to replace the Shenandonk, or that has induced a Detrut airernft consern to plan an all netal airship. more than twee the size of the Shendadock, to be fireproof and weatherproof

PROM the navy plans of the buge aerol. P decaduatights, we can posture them bristling with gens to repel attacks of airplanes. According to the description given by Rear-Admiral Mollett havy a r chief each would be arrived with twentyfive machine grass and with 9700 rounds of aramomition. They would have no armor, but would rely on the non-unlainmability of behaving as for protection from bullets fired from the ground and from

Their machine gurs would be so situated says the Admiral, that an enemy aircraft could not approach from any direction or angle without receiving a

concentrated fire.

"In this air vessel," he ailds, "five hundred men, each with forty five pounds of equipment, could be carried from San Francisco to Hawan in thirty hours and arrive after that journey with a twentyfour-bour reserve of finel.

OUR OFFER:

Your first step

Before disclosing an invention the inventor should write for our blank form "RECORD OF INVENTION." This should be signed, witnessed and returned to us together with model or sketch and description of the invention for INSPECTION and INSTRUC-

NO CHARGE FOR THE ABOVE INFORMATION

Our Four Books Mailed Free to Inventors Our Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and de-5s ribed



Shows value and necessity of Trade-Mark Protection. Information regarding Trade-Marks and unfair competition in trade

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost

Progress of Invention

Description of World's Most Pressing Problems by Leading Scientists and Inventors

ALL COMMUNICATIONS AND DATA STRICTLY CONFIDENTIAL INTERFERENCE AND INFRINGEMENT SUITS PROSECUTED

IMPORTANT

TO MAKE YOUR CASE SPECIAL AND AVOID DELAY YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to secure protection, save correspondence and obtain early filing date in Patent Office. To secure special preparation of your case send \$25.00 on account with model or sketch and description of your invention.



Private Office, Victor J. Evans, with view of Patent Office Through Window

Highest References Prompt Attention Ressonable Terms

VICTOR J. EVANS & CO., Patent Attorneys

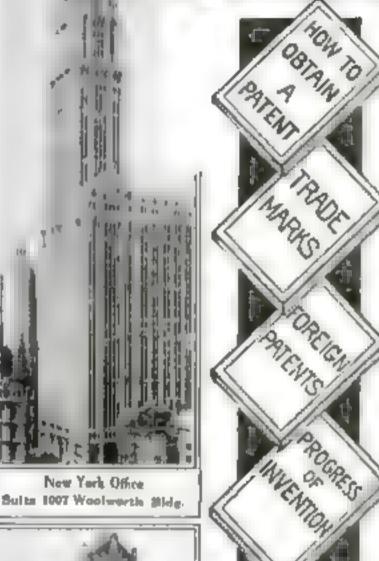
Main Offices: 769-9th St., N. W., Washington, D. C. Gentlement Please send me PREE OF CHARGE your books as described above.

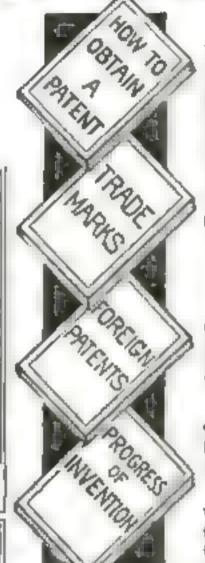
Name

FREE

COUPON

Address





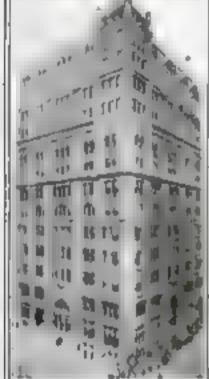
Chiago, Ill Office Sut a seed Tacoma Bldg.



Pataburgh, Pa., Office Salte 514 Empire Bldg



San Francisco, Cal., Office Suite 1910 Hobart Bidg.



Philadelphia, Pa., Office Suite 5:6-619 Liberty Bldg.



Washington, D. C., Office. Victor Bldg.



You Fly by Flying!

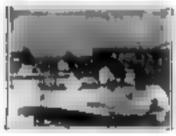
of Practical Airplane Mechanics

ported the democrate of teleportunishing for recipies were. The Sweeting Systems has the Lighties or sold and eight a list of rescription but he from the lighties of and place and he desired property agreement by 1 to 4 a fact the low management of the seat and agreement fields on the first the line consistence of the sold and the fact the line materials are the light to the light of the first the light the light the light that the light tha

THE OWERNEY SYSTEM

Pret prepares a subject by the product high the best work on product highling receiver. But a chain of subject high a chain of subject highling product the part of subject highling a chain of subject highling a chain of subject highling a chain as the subject highling highling a chain a subject that highling highling a chain and the subject highling highling and highling highling a chain and the subject highling a chain and the subject highling and the subject highling highling and the subject highling highling highling highling highlings. temple of the new who piles of the per burner for patagree discovery was an a top piles.

plot has been excited and
doing conserve. State
plant with the college has been precise,
as whiche is he has been an observe agent top
The limits of the six and sixes the war has been with
two big already purposed into



THE SWEENEY SYSTEM

Look at These

Opportunities Arieties Mechanics 458-5135 West

Esq. 575 Week

Fills 1215 Week

1115-1214 Week
Tail for ring
1109-3196 Week
Aurist Pivate Piles
1208-1239 Week
Special Messanger
berane 1128-1200
Week
Artist Advertising
1215-1400 Week
1215-1200 Week
0rm Surry

Been turrey 3424 3425 Week

is allegated but o Liver part - F. R. F. Y. G. a. to the constant of state of the constant of

paretable The can called our new plane quired in arisinfor prechanges and denotes between plane and the arisinform prechanges and electronic between the arisinform of the ari

Aviation is no imager a paya-bery see brings a busined from the a construction of source and busined from the past instity as a inscription or an elle from see pair input or leptory. The most of the grounds are required for time single. It has be the more great on the first one as give bringed to the more great or the first past as give bringed as communicated or the first past of example en more business of the more great or the first past of example en more business of the past of the pay to the payable of the past of the pay

SEND MANE TODAY for full-petalle of this entrans and photographs of planes on the continuent are taken by the containent are taken by the containent and of the state of the container and of the state of the st



SEND THIS NOW

EMORY J EWEENEY President 1531 Sweeney Bidg., NAMESS CITY, MO. Please send me hill information about your Asiation

■ Name

Address

• Tuwn

Busin

A Game of Uncertainties

Continued from page 21.

excludes the sport from the list of exact sciences, it is significant that one breeder. John E. Madden, a close student of heredity, produces at his breeding farm, Hamburg Place, Ly., the greatest list of money-wittpers with amazing regularity, year after year.

Still no man, not even Madden, can be certain when he has a champion on his bands; no man can be certain that his champion of today will be a champion a week hence. And so it is that race horses receive care such as a loving mother lavishes on her first born. The delicate racing thoroughbred requires corldling. petting, and absolute regularity in feedling, exercise and grooming.

ACCORDINGLY, the typical racing stable is a large, complex and expensive establishment. There is in charge the trainer. He may be an employee or he may be the owner of the burses in his charge. Depending upon the size of his strong," the trainer will have accordants foremen, stable lunds, exercise boys, a cook, for each log stable feeds its persont el. and, of course, jockeys,

The day for horses and their attendants begins with dawn. In charge of exercise boys, the horses are taken to the track This horse requires a long could trening gallop; that one a brisk workout of a half trale, another a swift run of a longer distance. Scarcely any two hooses are alike in their framing requirements, Some will do their best only for certain exercise hoys. Some are stuggesh, others lively some mean-tempered others stand and gentle It is up to the trainer to know the peculiarities of his various charges and to conduct their training accordingly. And that training starts long before they get to the race track—when they leave the sales ring.

FROM the ring the young burses go to pasture, where they rousp about uptil the full. Then their education begus, a process difficult and testions for their trainers, for these young ainmals are delicate, sensitive and highstrung, and easily can be harmed irreparably. It is often a real job, for example, to teach them to remain alone in a box stall. They are frightened by their new environment, and frequently refuse to eat. Gradually. though, they become accustomed to their change of circumstances. Then is begun the "breaking" process.

The first step is to accustom them to but and bradle. After this, an exercise boy mounts them bareback. A couple of muscular stable hands act as assistants in this lesson, for these young aristorials of horsedom can put up an exhibition of kicking and bucking that would do credit to a rodeo. Eventually, though, the youngsters are walking pracefully about.

Then they are sadded for the first time. There are further objections from the y sing horses, but again the patience and kindness of the trainer prevail. Walking exercise is the next step, usually in the company of an older placed incre whose example has a steadying effect.

When the colt or filly can walk to the satisfaction of its (Continued on page 131)

Four Vital Subjects

The Lord The Holy Scripture Life - Faith

by EMANUEL SWEDENBORG

Book of 634 pages, clear print good paper substantially bound in stiff paper covers, Endowment enables us to send this book to may address without further cost or obligatron on receipt of only

Five Cents

The American Swedenburg Printing and Publishing Society

14 E. 41st St., New York

Several live-wire substitut wanted in every state to sail Carter Oil Gaugest to Ford owners, dealers, accessory stores, garages, ete Our unbaue inter but graben it easy for hundreds of ealremen to get \$50 OR MORE WEEKLY

Full or spare time-repeat orders with liberal commissions much permanent, lag-paying business 100,400 Carter Gauges a ready sold every Ford car should have one amplied describing our car patached fully

guaranteed. His mice campa un just start-Write or wire for full details.

CARTER GAUGE CO.

412 Webb Street

Daytan, Ohle /



Inthe the ferrite make over 12% a week in apare time 4% or here a week in tall the 1 cry are there as a few antennas described the sale producting the sale as a 1 and or lease a feeting through the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale to the sale and the sale are to a sale and the sale and the sale are to a sale and the sale and the sale are to a sale and the sale are to a sale and the sale and the sale are to a sale a



HAVE YOU AN INVENTIONS

If so the WORLD PROGRESS will

when you upon request another selvy. Here containing No. 1 to 1 few out as a complete, which were the containing solved to a minimum of the containing solved through size many many of containing solved through size many many of containing solved through size many many of containing size of the con

WORLD PROGRESS PUB. CO., INC. was 261 Violet Bidg. Washington, D. C.

Wrestling Book FREE



Frank Gotch and Farmer Burns only and provide the symmetricity. It walkes to could not provide the symmetricity of the street of the symmetricity of the street of the symmetricity of the street of the symmetricity o

A Game of Uncertainties

I assumed from page 1301

trainer, it is taught to "jog," then to canter, always with a well trained older horse as a model, and in time it is ready for advanced studies at the starting barrier. Thus is a mechanical contrivance, developed to Australia—a strip of fabric that stretches across the width of the track and is spring upward when the starter presses a button. The barrier is used at all cace courses in America, and a large's abuity to "break" the instant it rises is of prime surportance; for race horses attain top speed almost in their first stride

"Schooling" at the barner is conducted each morning by the official starter. It is a task that would try the patience of Job. In time, though, the young horses learn to stand reasonably quiet behind the lurrier while it is down and to leap forward when it is "sprong.

THROUGH thus period the voungsters ditioning purposes; that is, for the development of muscle and strength. No effort is made to test their speed, and meanwiole their owners and trainers donot know whether they are embryochampions or just good and the horses.

When the young horse has learned the various gasts and has developed sufficient. strength, he is given a speed trial. First, he is sent an eighth of a trole, or a "furlong," as the distance it are only called at the track, at top speed. If he can cover thus distance in about twelve seconds, a quarter of a nole in about twents her seconds and a half male in about lifty, he will " do. " and I is education is continued. in the finer points of runing technic

After the second January following his birth, the young horse is preminted a twoyear-old, and if surhearity schooled, he is sent to the races.

Young horses making their debut orthograpy run half more races at first. Later they run hour and a half furtomes. Between May and October the standard distances for two year-olds are five and five and a half furiongs, and occusionally six forlorgs. In the late full when they are seasoned,' they compete in races of seven furlongs and a muse. In their second session of rucing as three-year olds, they race against older horses and at all dis-

HORSES are handicapped by making the better horses carry heavier weights in their races. These are made up of the weight of the jockey and of lead parts placed beneath the auditle cloths.

If, after the long training period, there could be any certainty of performance. the breeding of race horses might be something of an exact science. But, as an exact science, it would lose much of its glamor much of its appeal.

Any trainer will tell you that because a colt has shown disay flights of speed to trud gadops is no guarantee that he is destined for greatness in actual racing. Horses are not putchines, but, like men are subject. to moods and caprices. Some borses are "front runners." and turn in their best Continued on page 132) races when leading



Do You Need BIG Money? The Drafting Field Needs MEN! Get into the Line that is BEGGING for Help. A Line that's EASY to Learn! Read My Offer to FURNISH ALL TOOLS!

This offer boils good to the all-ing man classes are filled to espacely Every industry to elementing for deaffactors. Two hardres or more of the laggest maceres sub to us first a fill-ing druft of ream postulates, I rept to heep their good with. I can't afford to disappoint them. So for the present of land - topicity correct or you good - topic and tobic - symbols and triangles, gotto and provide,

Not a penny entra for the INED'S W. DOOR M. S. s nich at for even the drawing paper and traving cittle you need to get down to business. And I've made special letter was easy you can car's the memory fire time ever while I'm

QUICK ACTION "HOW do Livery the Dobe of read 12th a march?" pon early set. His accuracy that one instruction in the course of th they if his he make the gravery op palary making a few phore the order. Will YOU!

DRAFTSMEN AMOUNTMENT year on Help World ofory non-spaper. Twenty calls for draftment in 100 ad for desirations of mechanics. Dops tony can part time of abot down, but they never abou dangering and draffing. The year over hear of a straffingers who was loid all * No. The deaffing officer are part of the business.

IMPORTANT! DRAFTING last "drawing!" You dur't need any talent. A draftman uses tooks for every line and every spire. You condite! I make them even every line and every spire. You condite the proposition of the property of

PAYING POBITIONS from up almost as tent of you meets daily for indicarnon for men only partly through our pourse. We dishe a logisher "some oursers with us, no long as he is a tube trail of man and has begun right?" no long on he is a "color tradical rate and has begun regard.

Forthermore a lot of our students are willing in carry special,
mark for pay their, while their towards go on Lasten drafting,
and pay I have a trade on notarh att other fractes depend.

They can a build a doors without machanical drawings. The

student review over the made with a draftional has put every

part to black and white

YOU NEED BUTHING we don't furnish: that is if you not new and get the offer that includes from tools and equipment sublest extra aspects. But all I sek now it your name, just as me produced the particulary and the

CHIEF DRAFTSMAN DOBE, DIV. 13-48 1961 Lawrence Ave., Chicago

Betel me FREE and PRETPATO ful information about their reputing and a negative exercist to above the back easy it is to learn desiring and how I would like the work, foreigned pour free back after.

Address	
P 4). Stel	



Remything your result in short or testure and. Cherry the testure species ince in will species up. Have more morely up parameter, with the They make an America, portion, with They a make an America, portion, vic. Top dan't it is presidently to may be human entropy. It have they make may reproduce property to the proof of the property of the con-traction and property of property to the majority in company of Make 20 to 1, 100.



Meyer Both Company, maintaining the Studios in the World, offers you a practical training based upon 25 years successing producng over a quartes million draw age for leading advertings. This attractive profession equality open to men and women. Home study as-

Get Facto Before You Enroll in Any School

Send 4c in stumps for illustrated book talking of the purcess of our students.

MEYER BOTH COMPANY.

Dept. 15 Michigan Ave. at 19th 5: CHICAGO, ILL.



"The Boss Was Stumped"

"He was trying to figure out a way to speed up the machines. I could see he was during and I asked him it he would let me try my hand at he "Go ahead," he said, but I don't hence you can help much. Looks like an outside job to me."

so I started right in and pretty mon I had the me and I could see be was an overed

"How did you learn all that?" he asked in that quiet way of his. And then I told him I'd have bludying as home pights with the I C S. I'm duly's say anything and I thought he had

formation about it until he called me in his office in the weeks later. He said he was going to make me format and increase my maker \$25 a month.

There on about up the rold me. 'and you'll get another promise a soon. You can't heat hose International.' Correspondence is hoster as could for made about.

Schools es disaks for good, sound pres un knowledge

The 4 a cross story of what snare me atury has done for just one man. There are houseds of others. Why don't you take up a huma-study course with the Inand prepare pouncil to earn more



Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS

We NOTE: On the section, Frame,

Differt and largest on position section in the hard

We should cont, please tell me how I can quality for the
partition or in the a quart between thick I have marked on E;

Management TRAINING Counses Management Training Training

Resigner Management
Links at a Management
Depropage of States and Laters
Traffic Management
Hus men Law
Finds of Armeding Law
Ministry Law
Ministry (see sating 1 P.d.)
Ministry Cast Accounting
Ministry Cast Accounting
Ministry Response
Management
Management
Ministry Cast Accounting
Ministry Response
Management
Management
Ministry Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Ministry
Mini

TECHNICAL AND INDUSTRIAL COURSES

Stock for Engineer

List to Lack up

Mechanical Engineer

Mechanical Districts

Architectural forsita Each and Engineering
(1se to lighting
(1se to lighting
Mechanical Engineer
Mechanical Engineer
Markers Shop Practice
Re rood Plattions
Our Engine Operating
th Engineer
Mereying and Mapping
Metalluray [, Minley
Bland Engineering | Radio

Arbitaci

Magge Birnet Address.	QL-		6-25-2
City		Brass	



A Complete Conservatory Course By Mail Wonderful been study manie besons under great American and European trachers. Endocsed by Paderswald. Master teachers guide gos tooth you. Leasons a marvel of simplicity and completeness.

Any Instrument wite telling on every process.

Any Instrument interested in Plane Harmay, Yoles, Public School Monte, Violin, Cornet Mandain Guiver, Banja, or Road Organ-and was will send our Free Catalog.

The details of course you want. Send now LINIVERSITY EXTENSION CONSERVATORY

A Game of Uncertainties

touts not was a proft

the field from start to finish. Others are fleet but faint-hearted, they will get off hke lightning, but quit to a walk when challenged by another racer

Inconsistency of horses, and sometimes shocking "form reversass, altend every operation with the racing thoroughbred A conspicuous example is that of the noted Morvich, witner of the Kratacky Derby in 1922.

T'HIS colt won his first race at Japunca, N Y., at odds of 40 to 1. He won his next start and his next and his next, all in hollow style. He took first place in every start he made that year. The next year, as a three-year-old lie romped to victory in the Kentneky Derby, (and netted his owner, Benjamin Block. 838,4.a),

And then, just when the wise nien of the List were ready to place the seal of greatures on Marvich, the cult's agreer on the track came to an abrupt end. He was ingloriously defeated in every sta-tbe made. So his aware gettred him to the stud farm. As an investment Morsiele paul generously, for he won \$174.500 during his career. To his owner, though, and to zore goers generally be was a doappointment a hursted buildle

Or consider the case of Zev. Harry S. Sinclair Comarkable out, whose warrings of \$313 (830 in three years of menug broke all records for earnings by an American horse Agetor in the formus kerticks Derby in the international quitely race with the English Derby winner Papyens, and in several of the richest America i stake ruces. Zer seemed one horse that had carned the title "great

bet at the amount of his career Zev developed canning because have and capricious. He had lest name of his amazing speed, but no jockey no effects of his Iranser, could make him extend branelf unless he wished. So he was withdrawin from metur.

Consider also, that greatest of all American pacers, Samuel D. Raidle's wonder horse, Man-o'-War. This marvelous performer stood in relation to the other horses of his time- perhaps to all other horses of history as a dimposed to a bandful of pelibles. Yet once in his tweets one starts be was heaten, unexpectedly and onexplamably, by a horse that oddly enough was ended I need

THE hope of every man who taces horses, professionally or as a bobby, is to possess himself of an arrigul that has the balance in speed, courage, endurance. action health and lemper that racing men call class "-qualities that enable him to do anything his trainer asks of him; to run on wet tracks or dry, in sprints or long races, to carry weight, to withstand shipping from track to track, chimatic changes a horse in short for whom wipner or loser, no excuses have to be made

touch a horse was Manso War Such borses were Exterminator, Rounce and Grey Lag of recent memory and Sysonby Domeio and Saviator Such a horse, probably Pompey last years two yearold champion, will prove to be.

YOUR OWN BO

Fascinating Railway Work

Thirties to the same tender hear home or which is the state of the state of the second control of the secon

contacts with coang to mayn, we plate grad as a search as start 5,8 to \$40 km as a search as start 5,8 to \$40 km as a search as a sear

for FREE Booklet No. L.64 WANTED TO FILL Standard Gunnaus Training furt. Buffelo. N. Y POSITIONS

PERMITTERS

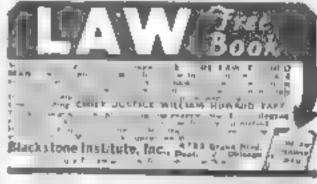
Why book (our pears for to y a Pay Your R. R. Fare white my shortPrice a state office facts. Save (INE TITIED NOW,
I my leaves a hereal tools on pristal equalities to No
Entit baseled che
quarred Year Mory Errs 575 to \$150 Weekly
repended Titier to report America's 20 000,000 cars.
FREE Write fine hig 64 peans head commerciable
FREE with Don't majt a printing.

ACC SWEENY

AUTO TRACTORSCHO 714 and Walnut Sty. Dept, 131

Men Wanted

to tomographics, M. O. T. vs. and Novelties, No. Depoint of the weeks is with many stage where will be He was a side on the day on the part of the below the state of the sta The state of the s on a local train a local blank is revenue to particular to a construction of the main result of the main res



AGENTS 500% PROFI GENUINE GOLD LEAF LETTERS.

Guaranteed to never twentsts. Anytine conthe to main of one ages office is office. Enter the decision is perpendite that the payon in the contract of the payon in the contract of the payon in the contract of the payon is and in the office the payon is a seen as a see 72) METALLIC LETTER CO. U.A.W. Con Street Change



STAMP

will start you on the road to success. See Money Making Opportunities on pages 116 to 142.

Only the Daring Can Work for Him

I and named from page

Ernest's feet, trying to turn him over the third time before the flier hit the net But Ernest's head was twisted just a I tile to one side as it met knotted ropes. He dual three days later

Within a week of Labe a death in Chicago, another flier, Jack Ernest, who also trained in Eddie Ward's Bloomington harn, died in Rio de Janeiro. Jack was trying a two-and-one-half forward somersuilt. The particular danger in this trick is that the firer is revolving face forward and if he misses his ratcher's builds in apt to meet the net that way Jack missed his catcher's hands and stied from a broken back.

YE had a good many of them in the L hospital from time to time, says Eddie, "but those are the only two thers Cyer lost

I've never been able to find out just why Bient continue to flirt with gravity when they could earn almost as much money doing less dangerous and more ensily mastered acts. It takes four years to make a filer. Eddie has some one on the inpured but nearly all the time. Yet his Bloomington rehool for fliers never lacks applicants. He always has a wattrig ast. Perhaps it is because he has a way of making stars out of them.

Twice each year for three years, Bert Ward last divid from the top of the rue ging to the net, thirty one feet below. and during his thirty-one foot fall has turned a backward somersault -- a d-mble pirotelie-a horizontal domine revolution

and another back somersault, before behas dipped his body ever and moded on his "balled up" shoulders. Bert, who is 28 and weight 138 pounds, will, in all probability, break his neck if he miscalculates the tenth part of a second. Illust I e learned the trick with a safety belt and since he took the belt off has not magalentated yet.

"Why do you do that fancy trick" I asked Bert at Schenectody N. Y., last sammers. "It will get you sometime.

BERT looked at his chief, as the two Way do I do it 2" he asked the veteran "Why does a man want to be president of the lined States? Entitle countered. I was in the 1918 is bond which near Gary that killed my aster and another g rl as our company and jammed up every one else in the act. I've hang head down ward longer than any man on earth. I own a valuable home in Bloomington, I own a farm near Cedar Rapids, Iowa.

"I don't have to dress to tights and do stants for the towners twice a day in all kinds of weather. I don't Agre to put a level and tape lines on my riggings to be some they are hanging straight. I don't hare to figure on gravity day in and day out I don't have to do a lot of though that are difficult, dangerous, and sometimes disagreeable. Neither does Bert or any member of my company

But a fellow gets a kack out of doing any star act in a circus or out of it. It's great stuff while at lasts.

A Big Money-Making Business A Business to Enthuse Over—The "Ideal" Lawn Mower Sharpeour A wanderful invention that chargess found mowers actantiff-eatly—quickly—perfectly; does the work so nothing size can. FRED C. MILIERT OF ROSELLE, OLL., WRITER: The Ideal Lown Mower Sharpener put me in humans, start og in the bacement of my home and forcing me new for the third time to more into begger quarters. Today the drawn of my afe is shop of my own: is teauted. With a machine like yours and a little hunte any man can have a business of his own and he independent." E. W HirCornick, Enginee, Weblgoo writers dr. F. Roudt, Bullets or the "I made sem to to ill days with my June". Have made as high on \$88,76 in one day." ers last season and he re-"I have ground over \$,000 movers during the past five or ch is not best for a side 5 Name booking World'ing at 1827 method Landaure i sharpened Tatawa howers for You Start Now No town ten small, D. S. Newcomer of Vinton, Ia. writes. People come from miles around and from other towns to have their mowers ground. Lawn mowers are da is owners don't him where to get them chargened, blowing the lawn dreaded because of duli or reproperly therpeased mower. Lawn mowing beatthful, invigorating and pleasant when mower is "thought charpened. You do the work attentionally you are in big demand Lawn Mowers Sharpened to Razor Edge Foods glad owners delight to moving laws with moving pharponed on an "ldon!" Moveto run light weich elick-

click and the grows to cut. Build permanent business for pourself. Buart now! 4----Write Today

FREE Detailed filosand booklet Lot

WAR THIS MAIL IT TOOKY The Fale-Stant-Seath Company 918-944 Soil St., Physicath, Chin Phone good at once from Hintered Chin-tee and Smiths Let Beaute the R.

巴(明) | | needs men l

The Fate-Root-Heath Co.

\$25-044 Bell St., Physicalli, Philo

HERE is the chance of your lifetime to start in this business and start right by actual electrical experience in the Greet Slops. This 12 weeks training starts you into any branch of Flortness or Radio fields barn while learning if you wish. H. R. fare paid to Chicago on cash critoliments. It content tool outlit free with course. Send the coupon below now for full information about this wonderful training plan.

Here you have by not as processes or real has class by them on union supervision of feet dealers, the second of th

Complete, Up to Date Equipment Over 200 motors on the line of motor attered to post will employ instru-tioners a disserver arometers, electronic related and of deep rigger has acted to compact for windless, applying and form the Policialou right in the phop for an idea to come a least could be the could be a come in current gradual to the translated line and notation to believe that I. There are notice of the leaders on bears about by normal may here are but not bear on requirity took over one of the larger within and actions in the enginery

A 25 Ht.P. Minter für abgefeit gegetting.

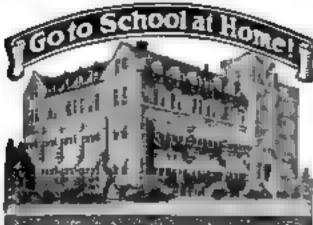
Free Employment Service e ris a get to every way as each Many but one to be being the manual of the manual of the state of the state

blame fortide to the course to by cetura

present within prince of the tipe of tipe of the tipe of tipe of the tipe of tipe of the tipe of tipe of the tipe of the tipe of the tipe of tipe of the tipe of t Physic and me full information and special offer for electrical course. It is understood that I am and obligated in any way

NAME





YOU ARE BADLY if you lack HANDICAPPID High School training.

You cannot attain business or social prominence. You are barred from a successful business career, from the leading professions, from wellpaid civil service jobs, from teaching and college entrance. In fact, employers of practically all worth-while positions demand High School training. You can't hope to succeed in the face of this bandicup. But you can remove it. Let the American School help you,

FIT YOUDSELF FOR A BIG FUTURE This course, which has been prepared by some of America's leading professors, will broaden your mind, and make you keen, alert and capable. It is complete, simplified and up-to-date. It covera all subjects given in a resident school and meets all requirements of a High School training. From the first lesson to the last you are carefully examined and coached.

ase spare time ouly

Most people idle away fifty hours a week. Probably you do. Use only one-fifth of your wasted hours for study and you can remove your present handlesp within two years. You will enjoy the lessons and the knowledge you will gain will well repay the time spent in study.

Check and mail the coupon NOW for full particulars and Free Bulletin.

American School Buot. H-575

Bruzel Ave. and 18th Str. Chicade

American School

Dept. H-575 Dresal Ave. & 58th St., Chicago and how you will help me win success.

- Architect Boulding Contractor Automobile Engineer Automobile Repaired Civil Engineer
- Civil Engineer
 Biructus at Engineer
 Business blandger
 Cert Public Accountment
 Accountant and Auditor
 Books, open
 Deaftman, and Deaftmant
 Electronic and Deaftmant Electrical Engineer

 Electric Jght & Fewer

 General Education

 Verations) Gildson
- Martine Share and the state of Formulation Engineer Surveyor & Magainest Talephore Engineer Taleproph Ragineer High School Syndrom Written Radio Understad

Name

Addition

Moths Cost Us Millions

Coal head from page 23)

out-of-doors in the hot sunshme for a day or two, if possible, before putting them away If it will not hart the material, press it with a very hot from using a wet towel on the goods. Soaking goods in boiling but water for half a minute likewise will destrey moth eggs, and washing in a strong comp solution is effective.

OR safe storage, cedar chests and cedar-lined closets are effective if they are kept shut tight. Once them only to put in and remove clothing. While the aroma of cedar k he the young worms. a cedar chest will not kill the nullers or half-grown worms that are already in the clothing when it is stored away.

The simplest precaution is to store your clothing in air-tight containers. Paper bags will do if you make sure that they are sealed tight and there are no tears, or protruding hangers, in them.

Weapping in several Bucknesses of newspapers is also effective. Plain paper does as well. Or, pack your clothes in postebourd suit loves and seal them,

When your clother become old, give them away. Every garment, especially if made of wool. Imag on a hook at the back of the closet of a line home for mother

While you are giving things away you night as well include the old stoffed for not see stored in the attic. One piece of it will furnish lodging for a thousand moths which, later, may explore more interesting regions downstairs. Look not for the furniture that is in use, too.

TP YOU have a pauso, lift off the front and inspect the felt inside. This is a favorite histing place for moths

Cold storage will prevent moths from attacking bus, but you can care for fore at home if you will brush, beat and air them thoroughly once every two or three weeks during the supposer-

Naphthasene in the form of moth balls or flakes will kill motion in all stages, but only if packed with clothes in a tight contamer. In a chest or trank, adow one pound of suphthalene for ten cubic feet of space. Gum camphor fumes are destria lave to moths, also only when confixed in an air tight container

Should you disease et a closel or room infested with moths, the best thing to do is to furnigate it with earbon disulphide or carbon tetrachlorade, both colorless liquids which produce gases. Set a copfut of either liquid in a shallow pan on a shelf of the closet, shut the door, real the cracks with paper tape, and leave it over night, Carbon disalphole is the more powerful chemical, but it is inflammable. Carlon tetrachlorule is not inflammable

Many methods formerly used for destroying clothes moths are useless, experiments have shown. Levender flowers. pepper, powdered borax, salt, cedar chips. tobacco powder and powdered sulphur are anyong the time-honored moth chasers that do no real good. While you are about it you may as well use preventives that are known to work

And if you see Izonblesome little clothes moth notiers fitting or crawling about this summer, swat them.

5th-Day or No Pay

Magic Dot Does It

Amazing little invention actually anchors new kind of support. It weighs little more than a collar button and is revolutionizing the treatment of rupture. Sold on free examina-



tion privalege. Restats quick. Clean comfartable. Why wear ox harness when this remarkable new appliance awaits you? Write today for the most interesting free book you have ever read. The New Science lostitute, 1021 Clay St., Steubenville, Ohio

Pay Him 40

5. W Allen of Caulforn made \$40 50 to one day's "joyful work "Hundride of other men are reportlog amazing incomes many of them doubling and tripling their former

Just Wear This FREE Cap hard wear the teamthrid hand abserted little has been feeled and a not where our freehalm not make only of each mail where the time of the team of the time of the freehalm is not make a miderally to street in that at upone the Not expected to he for the made. I so the following the time the made to the the made to the time of the made to the time of the time of the time of the time of the first time of th

Electrical room de finance de confedent comme de l'agreement de l'

Engineering to like the land of Marketonian like the land of Marketonian like the land of architectus of Manhamatics and Markington, but insight his signatus disposition commenced similare is worther the object head imarkingers. Complete Control

In One Year Prepare for your prefection in the most inforesting site in the world.

Local Demonstrator Wanted

The mursel of the uper the cents fireproviding his filtere distrate on new up and the the disputation of a sure to see a line approved to the property through the center of the seed of t remer to see the improved to the later to prove the end of the second provided to the secon terimenter eine gete voor terroops De 124 West Austin Ave., Chicago Fire Chief Paint Co.



SOUNDS IMPOSSIBLE After application of the magic hautd NOBURN you can stay in he often um all day without any sunte m Or ter bot tie now. Pay 31 NOBURN must make good before you say. Brook. Cobb & Company 348 Cen tral Viadurt, Cleveland. O



Many Agenta Earn A Week 00 A Week Selling Shirts

Offices Exeming \$100 Wealth william delection on the community of the month in flare of the community of the month in flare of the community o

CARLTON MILLS, 1900 SE PIFTH AVE. BOOK SEC. REW YORK

\$100 in Prizes

See Cash Prize Offer on Page 4 in front advertising section



Like Having a Private Masseur

This new winderly, Will Reds, my Beil produces the same continues and a supplier and an armore from any entire a second of the second and on set I used may except as one local even a part to the property of the set of the In a few weeks inches and inches of

and shall the safes whereas account where are reproved in the safes that it is the state of the safetire better it is shall be safetire better if the safetire is the safetire better in the safetire better in the safetire and the safetire are safetire safetire as the safetire are safetire and the safetire are safetire as the safetire are safetire as

Y e Haven. Onto

100 0001 St. New Haven Laun the attempton (Pluggae serial may be though oblige a material of the three or to the state of a serial plus point appropriate the large serial office.

Applement

Tour Skin Can Be Quickly Cleared of Pimples, Blackheads, Acne Eruptions on the face or body, Barbers Itch, Eczema, FREE Write lodge for my Fift & Books 27.
FREE Write lodge for my Fift & Books 27.
BLOOD Cash and Francisco Start S







He Lived Two Great Lives

Afterd and from page 18

"Well now, sar, I have tried you long enough. Now you have learned it is not numerous drawings, but the character of one that makes a thorough draftsman. hos home picture, sir, and you are a pantiler

It was with this fatherly advice in mind that Morse, on the day after the Sully arrived in New York in 1832, began at middle age his new career, and undertook the task of perfecting the first model of has telegraph.

It WENT directly to the home of his H brother, and there, melting lead at the fireplace in the frunt parlor, proceeded to spill the molten metal on the rugs and chairs, much to the consternation of his beother's wife. Next be moved to a little garret room on the fifth floor above a newspaper office run by his two brothers at Nussau and Beeknun streets. That room served as his fiving room. kitchen bedroom and workshop. On one safe of the room was his small cot. on the other sale a lathe on which he turned brass apparatus used in biolding as instruments

Here he toded feverally and messuntly. Here was repeated the old story. of inventive gennia contending with povcety. His funds had been exhausted in harope. He was compelled to live on the plainest of foods prepared with his own hands. To support himself, he had to full back on his pointbrush and to earn his bread hy giving tession in art

H's friends called him "visionary" others called him a "mad prophet. His hands were little accustomed to the mechanical labor which he was undertaking. No electrical apparatus was available for his use; all of it he had to make himself. He whittled models for his apparatia from wood, then from the models made molds and castings.

In designing his recording telegraph. his problem was to utilize the simple up. and down motion of opening and closing an electric errors to write an intell gible message at one end of the wire and at the same time record it at the other.

HIS solution was a generally sample. First, by means of clockwork he caused a ribbon of paper to move hor montally beneath a pencil. The pencil moved up and down. When it touched the paper it hade either a dot or a dash, according to the length of time it remarried there. When lifted from the paper it left a blank. Each of the variour combinations of dols, dashes, and blanks represented a letter. The movements of the pencil were produced by an e extromagnet actuated by a type rule or key which opened and closed the electric result according to the combination of dots and dashes destred.

Three years after the inception of his sies shound the Sully the first rude lelegraph apparatus was completed. Its birthplace was in the University of the City of New York, where Morse had been culled as professor of arts and design-

It worked! At the university, in 1837, Morse demon- (Continued on page 136)

Scatter-brained!

No wonder he never accomplished anything worthwhile !



High mind in a horige-porter of half dailed blens.
The bricks of a the country of healt dailed tension makes a property than there and bring about any of them.

Thoughts flash has produced of his his is with he growd of high to be them used in principle friending out old other helsele they have appreciate at alongs.

He to Brutter Bentwed.

He window who he down not get about the cubicat obstance who inhere with beautist p panels belon by Jefengerfülle bertade

The pilice is meet excused transcil, as require on with hispanile to the beginning and his terminal entire transcillation is after the entire transcillation in a few transcillations. विदेशकार है। विशेषी रेज्य हु वृत्त के दिशा विभागत के वाल्युहर्मा क्यार के कार्यमा क्या

11th trouble a that he does not have boy to use his His months tanks up towns his averbaighing

There are motives the free factors has surrename

It to be determine their that the miles in one contracts their to set the action is discussed and the property in a state of the contracts to be contracted in the state of the contract of of the contra

What runs he shows about 1 "

That has be encountered Probable and Chen develop the part of the part of the case of the part of the part of the case of the part of the

frequencies in the release of applical papersology, which has award the wife with he fortwork in religion. If has awarded power are individuals, all over the world, her will not drawn her consensed.

Among those who adverges Polycopies are:

A Proceeding Complete White high represent the processing of the Complete State of the Processing of the Processing Open State of Maritary Dysospecials, Advanced State of Maritary Dysospecials, Advanced State of the State of t

and others of equal priminener (an expression to

fout if you are made of he a aff has lost deatent i rectain a place if you have as in the lost in partial principle of the south as a place a space of the period of the property of the prope

The first principle of power success as 4 the connecting the harden is a first reacted affected to trend it also do do do do do the harden in the connection and the contract of the contract of the harden is the first sea that the contract of the contract of the contract the last contract of the contract the last cont THE PERMAN INSTITUTE OF AMERICA

Approved as a companion of several under the same of the state of New York City 19 West Such City 19 West Such City

------The Parlame testilists of America III West 48th St. South 625

(ii) they were the second and the second for an actually show for every part of the pages of Peace and an year type book. Scoulife from Transact, That pinces are made as shifteen whethere.

hom

Address.

City



"Iwas kicked into selling by my boss"

Harry Jerdan was talking to his old blend in Thompson, whom he hads t even for years. It is out agent in what on paste 5 CHIEF to jude for five years, and I could be

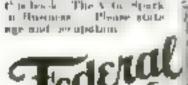
The age to be the permitted for the permitted of the perm but he sould be back me to the limit, aper know Length in a keryonal. Note the best a features he tire has enough to the time and a past like me. He had more faith in set than I had by myself.

We till, we tried to and it was the best

thing over larger over 1. He is the mark at a first the control of the control of

Why Don't YOU Become a Salesman?

Dup t make har the base to " they ver " you no kink you for a big name, its That wasten too might time It am langer here want I make the property to the property of the p t exampled to not ut once and find out for yourself we at amount in Francis can be seen that by the belief Mysters of Males I coming to y described by the The to described by the The to the Spate.



332 Federal Behook Eldg., Minosapata, Mina.

Plante send your book. "The Vita Spark to

N B. FIGH

Deck District Nation 1 ficitie some uptdress platining to margin.

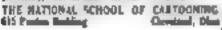
"STAMMERING

Its Cause and Gire **

You can be quickly a feet a just a strong the feet to come and or a basis of the best of least feet and the strong of a present of any and at a control of the strong of t ering of the color and the col

DRAW CARTONS

Turn Your Talent Into Money Ca templata cara from \$50 to \$500 per which can be seen that the server by thing this details and the place as best for the place and the place are placed for the place are placed for the placed





He Lived Two Great Lives

I saturar. from page 1 il

strated his invention to an astonished group of amentists, transmitting telegraphic signs through 1700 feet of wire strung back and forth across the room. The same year be applied for a patent at Washington for the "American Electromagnetic Telegraph." Another year brought the first public demonstration and the successful transmission, over ten miles of wire, of the first sentence ever recorded by telegraph.

"Attention, the I inverse! By king-doins, right wheel?"

TO MORSE, it seemed as if the final triumph for his labors must be just ahead. He had solded a number of important improvements to his apparatus. He had invented the electric relay one of the most brelant of all his actoevements, which made proof to transmission through infinitely great distances.

In his code, he had replaced the original numbers with letters of the apphabet And, not the least important, he had enlisted the interest and financial support of a young student in the university. Alfred Vail, the grandfather of the late Theodore N. Vail, founder of the American Telephone and Telegraph Company.

With high hopes, he was encouraged to go to Washington to ask the support of Congress for the construction of the first telegraph line. There, in the Capitol, he set up his apparatus and demonstrated it before Prendent Van Buren and his cabinet, members of Congress, foreign nunisters, and men of science. And finally be submitted a memorial to Congress for an appropriation of \$30,000 to establish an experimental telegraph line.

THIS done, be hurned to Europe to A obtain foreign patents, leaving his American affairs in the hands of friends and supporters. In England ins mission fuiled, but in France has invention created a sensation. There he was bonored by forement amentures of the day

Returning in 1839, he was full of confelence that his own country would support him with equal enthumany, But he had not figured on the apathy of his pubbe, of Congress, and even of his friendla.

No sooner had he landed in New York than he found all his hopes dashed to the ground. In two years Congress had failed to act. His friends were scattered.

He found himself stranded in New York unthout a cent, compelled to borrow money even for a meal. Plunged to the depths of disappointment and want be turned again to his easel and his brash for a living. Again be became a teacher of art

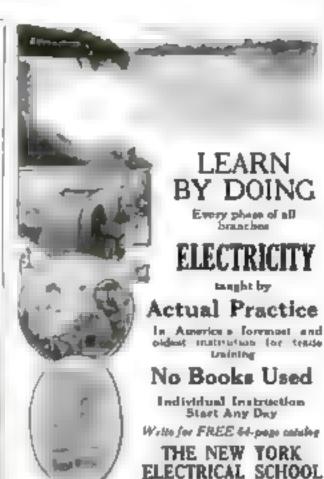
One day, to a pupil whose quarterly payment for instruction was past due, Morse remarked

'Well my lary, how are we off for DESIGNATE A

Professor I m sorry I have been disappointed," the pupil replied, "but I "Next week" Morse exclaimed, "I

shall be dead by that time"

"Dend sar" I am invest on page 1





68 West 17th St., New York City



Write for Free Samples MANGON SHIFT MYTER, BAS Grandway, New York



bey sold 108 in few days, now orders with a b. Magic new glars shield basishes fear of driving. Dime blinding bradlights. Same night driving. univeral principle by shorting eyes from nun-yet

Over 100,000 Sold Many Make

Many Make
\$25
A Day

Pris may car Owner can inwink Nowhthe to get out of order I and some to teteral Administration of artificial demonstration
as it is a learn above, and come is proved by over
the distance of the print place is released.

LEE-SEE CO., Dept. 65. Kewaunes, Wisconsin



New Quick Easy Way

Amosing new method has already enabled almost half a militon people to play their favority in a few months. You too, can learn in a few months for a few ventes day anthauta teachart

THIS method is quick and easy because the polaries You were with familiar tunes. Directions close as crystal tell you what to do. Pretures plain as day show you box to le it. Bufore you know at you are paying ally air favorites. In laste case, almapping prior max have can begin wrong with the weamerfully a aple nethod. It a carry an 1 15. C

It's Fun Learning

One of the reasons for the quick results is that learning of such for No Tedrosi вешле, то ва мар пристенение. У награнция pr so raind your frients will be area of But form and approximation or speed toner use to busin fill to the street parting in orchestical to ways a hig demand for them

Free Book and Demonstration Lesson

dener on this winderbuckness op it into a Seriel for more thanks in open more and a select themselves

PICK YOUR COURSE Plane Great Violes E-III Harmony and

Company Her Jugar Stegling Depring and Trape Burds Larest Pipe trans or 5 States or Marinish Mitwell Gallins Nara Carrett Pic nie Mandatin Classens

ile supinion Plans Acreston Vacco and Sporth Cultura Automatic Finger Control

to this at he liter being he will be been door will the s en randway to of your for the se marker of your for the second the modernment and some particularly in ecestes Little telephone to the place when see a man of Moon 45 tennesses. Yes York City District.

t S. School of Music 25 Brunswick Bidg. New York City

(Tends and me you feet book. Music Leasens to Your was from with in the notice for the hand Crate the momentum Leasens and on truly a of the Special offer a pure of cerested on the full many course.

Name .

Please or to plaint:

Address

CTL

RESIDE

You must overcome Pell-Coneriousness Mental The black of millioners in Sale of the gent-distance of Burell ancial world. Hend 10e for printing market. It ask to Poise and Achievement." I have been to be econquered Self-Consciousness in a set short Light State

SETMOUR INSTITUTE, 38 Park Rose, Days. P%. New York City.



orthing of home district the in advertising these ever

par FREE Cart. Open harmoning of Communications and con-PAGE-DAVIS SCHOOL OF ADVERTISING, Papt, 1345 Mill Michigan Ave., Chicago, U. B. A.

He Lived Two Great Lives

for the same project as the

"Yes, dead, by starvation,"

"Would ten dollars be a fany service?" "Ten dollars would save us life," said Morse, "That's all it would for

The youth paid the ten gollars, the last he had, and they dised together When the meal was ended. Morse said

"This is my first meal in twenty-four hours. My boy, don't be an artist. It means beggary. A dog lives better

In a final desperate effort to arouse public interest. Morse planned the first public demonstration of a submarine telegraph. He amanusced that he would string a line under water between Castle Garden in New York and Governor's Island, and that on a certain day the public could witness the exchange of messages. Don't here were mysted to attend the demonstration

THE night before the test, Morse h red a cowboat and laid the cable burself. Early the next morning a crowd assembled at the Battery to witness the new wonder.

Morse, at his instrument, exchanged a few aignula with his associate at the other end on Governor's Island, when suddenly

the line went dead.

Looking out over the water, he quickly new what the trouble was. Above the cable during the night a number of vessels had anchored. One of them, in mising anchor, had pulled up the cable with it The mystified milors, after handing abourd \$00 feet of the wire and find up no end to it. had est it off and miled away. The crowd on above secred.

But still be refused to be beaten. As a last hope, he appealed to his associates for funds to go to Washington again for government and. For reply, he received

good wishes and nothing more Notwith standing. Morse went to Washregion. How he did so is not recorded. but again he placed his asvention in the

Capitol. Day after day he stood there explaining admetines almost tearfully its mixiberer to indifferent congressmen. Some believed or him. Others wolfed.

THE appropriation hall of \$30,000 for the telegraph was introduced. But the weeks dragged by, and no action was taken. And then happened one of those strange manades which time and again have come to reward diventors who have refused to mut. In the closing hours of the session at the moment when all hope had gove glammering the appropriation passed both houses of Congress'

Morse who now had less than a dollar in his pocket, was selected to superintend the construction of a forty-mile telegraph. live connecting Washington and Baltiusice. Within the year the line of poles

and wires was completed.

May 34, 1844, was the day for the test of the experiment on which Morse had labored for twelve years. Seated at his instrument, surrounded by high government officials, the inventor flashed to Vail in Baltimore the famous message:

The artist-inventor's greatest master.

What Hath God Wrought"

piece was finished



Needed in

DO rou loss adventure! Do you want to make bug there are extended and the month of the survey of the and to re once an iring in it who are locking for a new or d. For home who qualify there will be thomsands of highly paid jobs.

Amezing Opportunity In the Airpiane industry

You, as you assisting to in its in many but pow a

Freedmating -Daring — Big Paying

Property New Yor Desput There Purmons

There I'millors

240 in \$150 per many
formanium at Leighton's

\$100 in \$100 per many
herestaring at Leighton's

\$100 in \$100 per many
herestaring at Leighton's

\$20 in \$20 per many
\$20 in \$20 per many
\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 in \$20 per many

\$20 per passe peng ph
herestaring at the per many

\$20 per passe peng ph
herestaring at the per many

\$20 per passe peng ph
herestaring at the per many

\$20 per passe peng ph
herestaring at the per many

herestaring at the per

\$74 to \$400 per my

the time to get by the har here a trapped exists in an to the marring pour a and to be a rong nont eu as belo e er are

Think how much a m Hon has be wresten by a half wise a t nomer galactic as a see a sady prived to the exist. Control of the exist of the exist. Or exist. Ores then product it ut in the near in in a therm we be not in which there is not become a present one In the balls are \$8 out made TI NIS APRE TE comors for every young

Be an Aviation Expert— \$50 to \$100 a week

The singly of existent is no functioning up the original work. Only only book of apart three a far at home and we heard purifice make with the first every tenors pushed full of interest. At the interest of the book of the first every tenors properly of the interest of the first every tenors are seen a function of the first every tenors of the interest of the first every first

Big Aviation Book FREE

Bred compon below for our new FixES hook piet out one Billed "Opportune win the Alephane injuster is in there extra and contraction. Get yours buffere estimate to hearing. AMERICAN SCHOOL OF AVIATION

3001 S. Michigan Ave., Chicago ------AMERICAN SCHOOL OF AVIATION

F Wood, 1985 Mitt & Michigan Ave., Chicago

Without any obligation and me your free book ! traper the Se of the As dark stide ' and left in the bar of the standard of the Practical

Acres

4 deres

115



ELECTRICAL EXPERTS IN DEMAND

Good positions await trained men Salaries of \$12 to \$30 a day not

The Electrical field needs men. It needs them badly. Hardly a week or month passes but what some new use for electricity is discovered. Each new use means new positions better positions — for men who have trained themselves as experts in this wonderfully fascinating work.

Why don't you study electricity and prepare for a good position at a good salary?

You can do it right at home in spare time through the International Correspondence Schools Hest electrical home-it do correspondence over offered has used by Eduan and Steinmers. Successful acadents everywhere

Mark and mail the compan today for descriptive booklet

-- TEAN OUT HERE --

INTERNATIONAL CORRESPONDENCE SCHOOLS Box 7680-D, Scraiter, Penns.

Olden and largest energy produces schools in the track! Repairs, writings abhiguous and large Land que, by he the position, or in the motion, before which I were L.

KPELLES (77 BAGINETE	r
Mertylciae	ŀ
Riestriciae Riestric Wiring	h
Manager Landson	ı
Riversic Lighting Electric Cor Running	F
Transcord mit Melbelled	ı
Henry B actely Truction Recorded Delitation	1
Krostelent Destition of	П
Kinetele Barbine Designar	н
Telegraph Fange	П
Practical Talestone	П
Later Market all, was man beit.	П
The Ball and the state of the s	П
INVESTIGATION INTERPRETATION	п
Mechine special Lancation	П
Tonimular	П
Gue Engineer	П
CAYIL RN GERBERN	П
Elegraph Paper Telegraph Paper Preries Telephone Mechanical Draftone Mechanical Draftone Machine Mosp Precion Toolmaker Cavill Enteredity Outroping Michine Paper Mechanical Mopping Michine Paper Michine Paper ARCOTTE CT	П
Mission Funtaget	П
ARCHTECT	П
Arrifletheral Praisemen	П
The state of the s	П
Archimetal Blue Friam	н
Phormus village villages and Short Motal Warber Manianton	П
Bhret Metal Warber	П
Mandanton	П

PROPERTY OF ENGINEER
PROPERTY OF THE PROPERTY

Perstaum Address	4 30-24
Mtak	
	757
PAL	1997¥
CLAND :	4.9 A 3)

Ensyto Draw Cartoons When Mayor in the RIGHT WAY

Some of the elevatest cartomists and entate artists learned how to draw in their space time by following Coviousiat Evans Stemple and Easy to Laser Method and are now MAKING GOOD MINEY Send one of your drawings, and let Mr Evans see if you have shelly and receive he Parginths of Covinous and indicates about the course it is not expensive.

THE W. L. EVARS SCHOOL OF CARTDONING

The Army and Your Boy

Continued from page 4

the example of his commudes, he entered into the life of the camp with nest. He left camp a remade man, and when the camp opened last year he was almost the first one to enroll. In one short year he had accomplished more than he had in the rest of his life, for he was making a conspicuous survess as a salesman and was namest ready to embark to his mess for himself. To him his first sojourn in a summer camp was the turning point in his life.

"Cases like these, and they are legion, make the summer camps well worth the money they cost the Government and the effort they cost the army officers who conduct them. They supply one reason too, for the macess of the camps, for men who have been benefited by them are bound to tell others and mostly in them a desire to attend. For the last few years almost twice as many as can be accommodated have applied for admission to the camps.

THE citizens' politary training camps offer four courses of instruction. The basic, or first year, course, for which no indicary expenence is required, and then the Red. White and Blue courses, which give graduates of the basic course progressive training for the various arms of the indicary service. A candidate who completes the Blue course may be commissioned a second heutenant in the officers' reserve corps.

The base course has a summum of military training and a maximum of athletics and recreation. It is open to men between the ages of seventeen and twenty four years, who are American entiretes or who have taken out their first naturalization papers, and who are of good moral character. They must be physically fit, but the requirements are lower than the regular army requirements.

A month in a citizens' military training camp costs you is thing. The Government pays your radiond face from your home to the camp and back. Unforms are provided. Helding food launtry and medical attendance all are free. All you need is a most supply of spending money.

Let's take a swift glance at a typical day in a "base" camp.

The hagle turns you out at a quarter of six in the cool of summer morning. Dressing, shaving, and tidying up quarters fill in the half bour until breakfast. And a good breakfast it is, for the War Department, realizing that growing youngsters who are getting lots of exercise and fresh air need plenty of good food, allows the cump authorities seventy cents a day for your rations, which is more than the regulars get. After breakfast, tents and company streets are put in apple-pie order for inspection.

AT HALF past seven, the real work of the day starts with a close-order infantry drill that lasts for three quarters of an hour. Close-order drill does more than teach you to get from here to there in certain formations. It teaches you how to manage hands and feet and head, and how to obey promptly without stopping to argue about it. A perfectly performed squads right" may bring a thrill to the heart of no one but a drill sergeant, but it a a lesson in teamwork. And teamwork is as valuable out of the army as in it

There is a ten manute rest after the drdl, then a lecture for three quarters of an hour on crimenship. Next come twenty indicates of snappy calisthenes, after which you re rotatent to sit down and laster to a becture on Lygene. This is followed by a talk so not tary tacties—and then it a bir is for another mean.

TWO hours of every afternoon are set aside for sports. You are encouraged to bring your baseball, tenms, and swamming equipment to camp, for you must play some game. You may pick your own sport, but if you have no favortie you must take part in group games. All the camps have facilities for awiniming, which is carefully supervised. The men always swim in pairs, so that no one ever is alone in deep water. More teamwork! Sport contests between companies arouse tremendous rivalry.

Rifle shooting is a nutbery exercise that has much recreational value. Americans like to shoot, and every Americans confident that he has an inhorn ability for bandling a rifle. Somet mrs this confidence desappears after a half hour on the rifle range, but many of the candidates make remarkably good recrea.

After the period for athletics comes the "high but" event of the ramp day—retreat. The companies drawn up on the parade ground present arms while the band plays the "Star Spangled Banner and the flag flutters slowly down the staff. Then it a time for another meal.

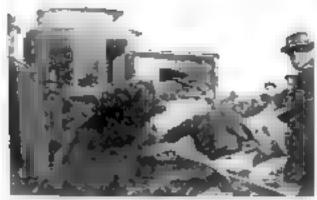
Your eventups are your own, provided you are back in camp by half past nine. Munical instruments are encouraged, and song to a universal nabit. Tapa sounds at ten in clock, but there are assally featinable to hear the last calls song rawn notes.

titer a month of that nort of life, a fellow has just got to feel lit?

THE I inted States with red for it Islams purposes into time corps areas. Each of these areas will have its enteres in stary training earnps. It is summer Their dates for opening vary singlify but most of the camps will be bess in Yogust Forty four camps, neattered from the Canadian to the Mexican border and from the Atlantic to the Pacific, will receive the Sci000 young Americans who will benefit from a month of healthful outdoor life under expert supervision.

If you decide that you want to be one of these 35 000, you laid better accurrently. Write to the CMTC effect at the headquarters of your corps area, for an application black. The local recruiting officer will tell you how to address your letter. Applications are accepted in the order in which they are received and approved. Last summer 57,000 men applied for the camps, but will all 200 could be accepted.

only \$3,500 could be accepted



LT MAIN AND BROADWAY

IF you were a newspaper reporter, how would you describe this accident for your local newspaper? Have you a nose for news?

Be a Newspaper Writer

Interesting work that pays well! Something new every day! Here, there, everywhere that something is happening. Meeting the biggest people all the time. Happy, adventuresome days associating with clever men and women who free That a newspaper work! Attending free aid some of interesting meetings and banquets. Reviewing the new movies and shows for your paper. Getting the che ceseuts at the balt games, at boxing and wrest ing matches, at the racing studioms, at the football games! Interviewing stars of the stage and screen. Your name printed over your arricles to friends will know and admire your Geverness. Is that a life? Big Demand for Men and Women Who Can Weite Experienced seccessful writers earn from \$3,000 to \$10,000 a year. Editors in easily every agate want us to

recommend trained men and women for puntions. Have Your Writing Ability Analysed Free Our Writing Ability Chare resp, your natural releas for newspaper whitest and also for general Writing for Profit. Our experts make a free report on your ability.

Limits to Write Like New York Reporters You learn the sylve within methods used by New York Rewips sets through our new horse starts a stree. Send for the Witting Ability Chart today. Use coupon.

Newspaper Institute of America

Appended as a Correspondence School Under the Laws of the State of New York 25 West 45th Street, New York, N. Y.

Newscaper Institute of America, Dept. 41 25 West 45th Steet. New York Send tour free Witting Ability I hart, and further in formation transform the upontential in Newspaper Witting and general Witting for Profit

Name Stema Con Oceanie

OPPORTUNITIES Bocome a Traffie Expert

The opportunities to traffic meaagement are limited only by the boundaries of the business world. The trained traffic man is in demand by transportation systems and by industrial organizations.

Three Detroit Firms
Pay Their Traffic Mimagers
Over \$20,000 a Year

Propare for this growing profitable profussion at home in your spere time under supervision of traffic experts. Low cost, easy terms. Thru the LaSade Prob-lem Mathad you learn by doing Valuable 54 page booking free.



Laballa Extension Bulvarnity, Bept. 583-T Chicago

For Yunderitte, Club, Lodge School and Par or Enword \$ 15 for legioners in our state of with laugh It should be a set of 23 found for brain go found of thick back began as used Support For. BALDA ART SERVICE Dept 7, Orbhesh, Win-

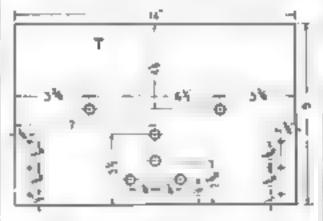
2c STAN

will start you on the read to success. See Money Making Opportunities on pages 116 to 142.

Radio Builders Win Prizes

(f and wood from page 61

No. 5 to No. 4 and continue it around past binding post No. 2 and filament switch 8, and connect the end of it to the rotary plate terminal of condenser D. Run beauches from this wire to binding post No. 2, the upper end of coil A, the lower end of coal B. and one terminal of filament switch & Now run a wire from the remaining terminal of Blamest switch A to one figurent terminal of each of the





Figs. 5 and 6. Front panel and sub-panel layouts. It might be neversary to eller errangements somewhat to must the parts you use

sorkets L_i M and N. It makes no difference which filament termaal you chaose. Connect one end of cutl C to that

ware at the nearest point

Connect handing past Na. 8 with No. B. and ron branches from this wire to one terminal of each of the rheostate H. J. and K. Then connect the remaining terminal of each rheestat to the remaining filament. terminal of the meket nearest to it. Note that the center socket If is connected to rheastat J which is mounted on the front panel T

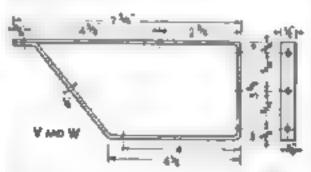


Fig. 7. The sub-panel brackets. This design is correct for vertical panel mountains. If you build your set with a sloping panel rabinet. You will have to hend the bruckets to correct shape

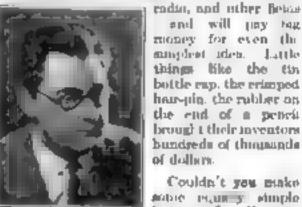
You have now completed the filament wirsing, and it would be a good idea at this point to insert the tubes in the sockets. connect up the A battery and see if the filament switch S and the rheestats II J. and A all work properly

Next connect the top end of end B with the terminal on the stationary plates of variable condenser D and run a branch from this wire to the nearest terminals of grid condenser E and grid leak G. The other two terminals of condenser E and grad leak G should be connected together (Continued on page 140) and to the grid

Great Inventors Now Teach You How to Invent

Edison Says Invention is a Science and Should be taught as a Profession

Thousands of inventions are needed today Just one little idea can bring you fortune and fame. The world is waiting for new inventions to engacering chemistry, household articles.



Repetond F. Yates.

and will pay bug money for even the samplest idea. Lattle things like the tin bottle rap, the crimped hau-pin, the rubber on the end of a pench brought their inventors bundreds of thingsupde of dollars.

Couldn't you make actic equity emple invention? Invent you klean that could be

turned into money? Inventing ian t a matter of blind luck-it im't a question of guestwork. Invention to based on certain principles. sust as any other profession. It follows a defipite course of procedure step by step from the origination of the first idea to its final development up a commercial segio.

Learn at Home Spare

Hitherto, every inventor had to work out these principles of appearing for langelf. For every standard inventor knows and uses these principles. He knows WHAT TO INVENT and HOW TO INVENT. But now you can learn in a few mouths what it took great mventure years of discouragement and terrific struggle to acquire

Raymond F Yates, who, with fourteen other famous inventors, has now sevented, for the first time, the secrets of invention. They explain how to originate ideas, bow to develop and perfect your taxas how to paten your inventions and how to see their to your rest advantage. In short, they reake it amaningly earn for you to become no absent or sar ply by learning the whole wanderful science of jovention, step by step, from beginning to sud It responses just fractioning assuments of your spare time at home

First Course of Its Kind

This is the first concer in practical largestian that has a or been dequed. You van any take Estern a notice and actually bears HOW TO IN VINT show to make in an one a profession. It is agic easies a simple retaind imagings you are told have successful executives work you know how to use the secrets of it on not that convert a sample but a deal of it is not that convert a sample. bitte idea into name).

FREE! New Book on Inventive Science

I book his just come from the press that tells At the call to a grown drawn has the Park Harberton's 15 december. tion. This work is I be sout to you fine. ou Bee do for an aventum. We exceed afford a send that break to those who are mer a encourage of the illitera. If you are gen duck to be only been your many and address up the coupers to you are so id a poor and NOW I

Bureau of Inventive Science Dopt. 15, Wisser Bidg., Rochester, N. T.

Bureau of Inventive Science, Dept. 25 Wiener Building Rochester, N.

Pieace send me your free book. "The Science of In-

Name.

Address

City Ptate

TECHNICAL



Sprd Year

A MAXIMUM of practical training in a minimum of time is offered you by one of "America's oldest and largest schools of specialized engineering"... technical training of college standard for men who have petther the time, money nor preliminary education to attend a university. Over 1000 men coroll each year in day and evening classes.

Short, Intensive Training

of a very practical sort trains you for a high salaried position. Many of our students are assisted to responsible poations of its graduation . . . they earn which y learn

Chicago Trebajeni College Bidg.



H you can't come to Chicago STUDY AT HOME

For remethy from testar bell of his a sighted drafteneous Testanel men dre to inchessed 46 Plant spilates, history 5 Prorepasses, without ma referent time retools

DRAFTING

In hear species they was passed being the hear globing to place to the configuration of the c

PREE TRIAL

'A non Perr (proch enn St No 1644 Stab-artiste fite meter, and

FREE OUTFIT

of regular EXX dynflaming a
outfill to evolution like the
order of the congress.

Send for 40-Page Book

of help about distriput soul for he reason the help broken for the firms of all brokens in deathful attendants on the firms reason panels by give in many the brokens of the foreign term, A of the most length and

Courses are arranged to suit your needs: 2-year diploma; 3-year B. M. degree; special short courses adapted to the individual. Instructors are experts, a tively at work in the very professions they lead. Tuitten in low forms easy futer new time.

Write for Free 72-Page Bine Book

it tells about the courses (full descriptions); about the great demand for Chicago Tuchmaral College trained men, about college athletics and other interesting facts you'll want to know bend for the Blue Book without obligation!

Change TECHNICAL College

Dopt. 58 118 East 20th St., Chicago



Starry name \$2,000 to \$10,000 a paper. Propose quickly decrease posts from the same without pure loans. For here well-said territories procedured from the procedure from the procedure from the procedure from the procedure from the procedure. See that the procedure from the proce

Dept. 1915 3601 Michigan Ave. Chicago Li & A.

AUTO INVENTIONS WANTED

Long retainshed namefactures of nuts accessories which are duity said by practically all wholeshe and the air accessory courses and collecter minimization are not short buring new not medically accessories the mark since character. Pater but articles preferred Address Anim Accessory Manufacturer Ross, 2 04, 310 S. Michigan Ave. Chicago. 111

Radio Builders Win Prizes

Complement from page 1.505

binding post of socket M. Now connect the P binding post of socket M with one terminal of fixed condenser F and the Pterminal of sucho transformer O. Connect the remaining terminals of condenser F and coil C together

The B plus terminal of transformer O should be connected to binding past No. 6, and the G terminal of the transformer should be wired to the G binding post of

socket L.

Now connect the P handing post of socket L to the upper log of pack Q; the

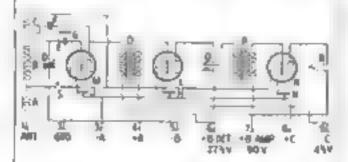


Fig. 5. Theoretical sering diagram. You will find pictorial sering diagram on page 61

second log on this jack with the P terminal of transformer P and the third log with the B pair terminal of the same transformer than a wire from the bottom log of jack Q to the holtom log of jack R and continue it over to briding post No. 7

Next connect the 6-terminal of frameformer P with the grid binding post of socket V and connect the plate binding post of flux same socket to the remaining

terminal of jack R.

Complete the wiring by connecting the F minus terminals of transformers O and P together and run a branch from this wire to binding post No. 9.

THERE are two good ways to fasten the receiver into the cabinet. You can drill holes in each corner of the front panel I mong wood screws, or you can bolt the receiver into the cabinet by dedoug holes through the bottom of the cabinet and the lower arm of each of the sob-panel brackets I and If The latter method was used on the prize set and is excellent be cause it channeles the extra screws on the front of the panel. It can be done exovemently only if there is sufficient space made the cabinet at each end so that you can use a screw dever

To put the receiver into operation connest up the auteron and batteries as shown. Turn on filament switch 5 and adjust the state H_i J and A until the tubes glow donly. The dual should be mounted on the shaft of condenser D so that it reads 100 when the plates are fully cogaged. Turn the dud on the scaft of coil f until a click accompanied by a slight bissing noise is beard. Then turn it back until the noise stops and turn the dual on condenser D until you hear the broadcasting from some stat on Thomedeately stop turning the dial and adjust all the rheastnts to the lowest glow in the tubes that will give you full signal strength. Readjust both dials until the signal is as loud and clear as possible You must be absolutely sure that you alwars operate. Continued on page 1215

PRACTICAL BOOKS

THAT WILL

RAISE YOUR PAY

WRITTEN measy to-understand non-technical language these books will help you in your chosen trade. Every book is an entire course of instruction condensed into one volume. Thousands of men have used them to increase their pay You will find them full of information and aleas that will help you take your pay

Painting and Decorating

Ross Crans Book of Home J.	furnishing and
No. of the contract of the con	4 loth 103.00
I say had no Mechania we	
prof. fig. p. 1. Into	Vandtreadket
	herb \$2.00
the nor Wick after the first	A property was a re-
Lest	herette [4.00
alle Meung of Columnand last	they promised
waller	Clisth #2,00
A Show at Show Cards	Cinth #4.00
Som Pa at og by Arkhanon	Cloth #4:00
No. 18 No of Designs	
leas	heart e 14.00
	H 11 \$2 00
4. 100	10 Oc \$1.50
Y A SECTION OF THE PROPERTY OF	cinch distric

Steam Engineering

			-
MIL RAIN	a sidderalk	4 St 600	Eng occup
			rette \$4.00
			CONTRACTOR OF
51 a thin	April 200	midal Y	Buggiore au
		2 M 191	mite 62.00
Sec. 13 of		elf p 11	FT F \$2.00
5 all 6	d at the ser	L 11	900 a sil
4 4	12 512	de ann an	- F1 50

Carpentry Books

4 - 41 file short	
Modern a money 2 has	63.00
North Page of the Principle	8,7.00
M to a men	\$1.50
F A CHAINE	\$2.00
Builde a first proof of the world	\$2.00
t etre	\$1.50
P. a. real Bangalows	\$1.00
Roof Pearing by Van Gasheek	41.00

Electrical Books

Tehn	, by		14	नेत्यम	A	100010	45 10-1	7517gl.
	lq.	11	1.4	.4	1.	F 4 1F	ek e	32 50
1	- Ir	1	· -lar -h	Tit.	4 11			12.00
11		None			11.0	- d h		81.50
A			51	H KITE	14.	11.11		81 60
	1.	31 1		'5 X	4			81 60

CHECK

-the books you want and mail today with your remittance.

Which is advout the brooks you order on our entrangle of a of you are not thoroughly on which which we go no your boars.

POPULAR SCIENCE MONTHLY 250 Fourth Avenue New York

Popular Science Monthly

versit herride

Flexue c 1 a in owits I are checked it which I e see that I are a f I are referring these sades on the basis hat d I am not it field y many will be refunded.

VB 000

Valence.

Radio Builders Win Prizes

C antinual from page 1400

your receiver so that it does not oscillate. The oest antenon for use with this set is a single wire about 100 feet long and as high as possible. If you are located where an autenoa of this length is impossible. use the longest unterna your locar condibons will permit and then if the broadeast up seems weak or the receiver times had sharply increase for number of turns the oil date in you strike the right balance. between serect vity and atolity to bring in stations with volume.

If you run into any difficulties either in the construction of the set or in getting it to operate properly, first check up your wiring very carefully then make sure that your butteries and tubes are good, Then, if you are still unable to locate the trouble, write to the Radio Editor of PRIPULAR SCIENCE MONTHLY and be sore to state your troubles as fully as possible,

Power for the Holy Land

AVONG many schemes for the deof I good the Dend Sen, which is about 1300 feet below sea level as a source of water power. The plan while starthing is not theoretically uppossible at is claimed by its proponerts. If it is argned, power can be obtained from water numary down to the ocean it could bke wase be laken from water coma g at from the ocean, I there is a lower basin to receive it and an outlet for the surphis-

The Dead Sen provides the basis and the seri which drives up the River Jordan. as fast, its water consent engineers say, would draw up enough water from the Dead Sea to prevent a possible overflow Laos scheme worod provide over 600,000 horsepower for the electrification of the Holy Land.

A Monkey Experiment

MONKEYS in cages are graceally sausy, ill marinered beasts. Professor Pfungst of the Berlin Physiologseal Society, thought that this was disc perhaps, to association, and determined to make a morkey without may monkey companions. The monkey was wellmannered from birth. For four years he new practically no other creatures except asan. He could not bear being shouted at or stared at. He yawned when angry-He never laughed not erred

Then he was introduced to another monkey. At first be was alread but his courage gradually increased and soon bewas like his companion <.

Proper Food Lessens Disease

THE connection which custs between B faulty nict and arease is well but trated by the Arnts. Dr. Hundrede the best-krown food expert in Dersnark, declares. The Arabs in the desert averlargeor on figs, dates, vegetables and a lattle nulk Ment is exten rucely

Despite the firth in which they live they are more immune to disease than Epropeans, Le says. But when these Arms desert their firty villages for the towns, to live like Europeans, eating the food Europeans do they become suscest ble to all the assesses to which Europeans are subject





Amazing New Facts About Old Age

"Did you know that two-thirds of all men past a certain middle age suffer with a certain seldom mentioned disorder?

"By the medical profession this is known as hypertrophy of the prostate And ecientists have now revealed that it is directly responsible for much of what many people mistake for actual old age."

NEW HYGIENE

But no proper should even approaching or past the price of at tout up with these passion and con-tournessing enablished due to the action. I is a a her my bur in an experie has die home than entitle his gland that the e nes & mi of highers that give hight to the most of him mouthle, often obniging new paper and higher to the cutate body,

MIDDLE AGE AILMENTS

Here is mountly quick relief for such distressed allowate to existing, arbay in buck, legs and leet,

A Test Every Man Past 40 Should Make



The coupon betweenth bring 5 or ERLE B & all a referentation beautiful whiteh will on able 5 me to tak 5 miles will restain questings which show you the true state of yags phones and thou I do included in all do conpen inimediately

necessares and irritability, when due to enlarged

I've a a those-and men test by to the value of from treatment.

FEEL TEN YEARS YOUNGER INSIX DAYS OR PAY NOTHING

So successful have been the results of this new hygiene in thesimple of name that the discoverer effects to send at to any man under the assisting guarantee that union you feel 10 years younger to 6 days you pur nothing. There are no drugs to guarantee the operation, dieta or lessons.

ALL EXPLAINED IN FREE BOOK

If you are troubled with any of the disorders mentioned. If you have shroute some pation or this treater in about do not die a a a steresting free best will els in the arrest et in the Why Mady Men Are this to be the Ly along the treatment of the appointful treatment to an eller treatment in the contract of the appoint in the contract of the arrest of the area of the arrest of the area of the arrest of t of year yeath of yegor and he free from pertain discompan below

W. J. KIRK 4057 Main Street Steubenville, Ohio

P-----MR. W J KIRK Steubenville Ohle.

Bend me fee w brut soligation page positiet.

Name

Minist Western Office Rept 40-E 7 | Van Voja Hidg-

The Electrician's Wiring Manual By F. E. SENGSTOCK, E. E.

Contains all the information need en for the proper installation of lighting and power systems in houses and other buildings.

It completely covers inside electrical wiring and construction in accordance with the National Elec-

> Perint stor Heathle binding Price, \$2.50 448 pp.

POPULAR SCIENCE MONTHLY 250 Fourth Ave., New York City



At Home-It's Easy

Just think 450 to over \$250 a week paid to good cart out to it work that a fun? And Yell gain casde learn actogning at home me mat we if any veneral in the dark ing penell. While for instetesting FRIT Book descriting out easy such lifted method Another aids of a seed Dath? Her' would prosted today to Washington School of Cartooning.



Turn b

How to Pick the Best Car in Its Class

(Cantraued from page 66)

be sure that the brake and clutch pedals work easy. It doesn't make much difference whether Grace can reach the pedals or not. You can fix that by putting a eushion behind ber back. In fact, it would be better to pick a car with plenty of leg room up you won't feel enumped on long drives,

"What's the dope on overhead valves, uncle? Are they really much better?"

THEORETICALLY they are all I the racing cars use them," replied Gus. "But in a car for ordinary use I ean't see that there's much advantage. They may result in a slight maying of gasoline as compared with the ordinary valves that are praced in a pocket beside the cyander head. Also, a th overhead valves, you can take the cylinder head off and remove it to a warm place in the cellar when you want to grand the valves instead of working in a cold garage. On the other hand, overhead valves usually are moreer, and as there are more parts in the valve mechanism, there is more to replace when things begin to wear."

"Humph!" exclaimed Heary "It sure is a hard job to pur you down to a definite opinion as to what is really the best ("

tions smaled.

"For the darn good reason, son, that there isn't any such thing as best. The fact that there are so many different ways in which musoline motors are made shows that the designers can't agree. Whenever there are two wave to make a piece of machinery, there are always good arguments for other way, and you'll have to decide for yourself which of these ways fits in best with your wav of doing things."

"Do you think a car with four-wheel brakes is safer ups ler "questioned Henry as he stooped down to inspect the front wheel brakes on one of the exhibition cars.

ONT worry your head over fourwheel trenkes. advised bots thought-"I've fixed a powerful lot of fully brakes, and as far as I can see, there isn't much in this four wheel business as compared with one real good pair of brakes on the rear wheels. Four wheel brakes are fine in theory, but durined few of the outfits that I've looked over were working right, and on the low priced cars. I in inchaed to think that their disadvantages just about make up for their advantages. "

They say you can stop quicker with em Henry argued.

You can if they are adjusted right; but you have to be careful not to have the from t-wheel brakes too tight or they might lock if you jamined on the brake pedal too hard. And if the front wheels lock, son, you are mighty likely to get into a nasty front wheel skid. Mind you, I'm not suggesting that you don't buy a car with faur-wheel brakes. The point is, I wouldn't consider them a feature that would influence use to buy some particular make of car that was no better in other ways than another that did not have them."

"Those wheels look pretty solid," observed Joe as he directed their attention to a sedan equipped with disk wheels.

Sure they re solid," grunted Gus.

"Why shoulan I they be-made of metalthe way they are? As far as I can see, about the only advantage of disk wheels is that you can keep them clean cass t than the wood wheel. On the other hand, you have to take your wheel off or else crawl under the car every time you want to adjust the brake bands. You can't work between the spokes as you can with Wood wheels,"

But, mucle, they look so stuffy" targed Grace.

AD we've just got to be stylish? right. Henry, let her have the disk wheels if she thinks their classy. You can take the extra amount out of her allowance.

"That a not fast, said Grace, ponting "Get your old wood wheels if you think

they re just as good."

Henry was collecting estalogs right and "I'm going to shely these over mighty excefully when we get home. he said, as he varily attempted to stuff another large folder in a pocket that was already crammed full.

"That's a good idea," Gus agreed "While you're here, you and Grace had better sit behind the wheet of every ear in your price class so as to get a line onwhether there a enough leg room. Work the pedals, and see if the gear shift lever is bandy. Watch out for any car that have a gear lever that slates up under the dash. when you go into reverse. It'll take all the skin off your knuckles if you have to back up to a horry

Suppose Joe and I leave you now for a whde." Gus concluded. "We want to look over some of the accessory exlubils. We'll meet you at the door in about three quarters of an hour."

"Why can't we look over the accesso-

ries, too? 'asked Henry

"Nathing doing" Guicardered. "You stay away from the accessories or y act. end up by fitting that new unit with more pink than it will carry. No, sir! All you need to the way of accessories of least to start with one front and rear bumpers, a rear visiournizror, a windshield wiper and a space tare"

DON'T want to ball in Gus," and Jue when the sound couple were out of hearing. Did it land of seems to me that it would be a good idea if Henry bought a second-hand car. He barely knows how to drive, and Grace never even has learned how. They are board to do a lot of rotten gear shifting and the chances are that they will can into a lot of minor accidents the first year Abd if they re going in bust things up it might better be a second hand outfit.

"That suil true, and Gas, "At least it would be in any ordinary case. But Henry is careful and he's the kind of a bird who can't seem to take pride in any thing unless it's just right. He li take much better care of a new car than he would of an old one. Bendes, if he got a second-hand car, I in afraid the Model Garage would have to do a lot of free repair work this year. he concluded with a chirckle

Here Are Correct Answers to Questions on Page 43

- 1. The heart tends to keep time with any strong rhythm that you hear. Ordinarily one's heart beats about seventy times a minute. The rhythm of a fast march makes your heart beat a little faster, the faster heartbeat improves circulation and makes you feel more active.
- 2. Alcohol was used a good deal, also the juices of certain plants like opium. The ancient Egyptian surgeons had a way of hitting the patient on the head in just the proper place and then operating while he was unconscious from the blow.
- 3. It is water which has been turned into steam and then condensed into water again. The process leaves behind some of the impurities which cannot be turned into steam. The distilled water is therefore purer.
- 4. Many of the sun spots remain for weeks in about the same place on the sun's surface. We can see these spots move as the sun turns around on its axis.
- 5. Yes. It attracts the water just as the moon does, but less strongly, because it is so much farther away. Even the other planets have an attraction on the water and affect the tides.
- 6. Froth is made up of thousands of tiny air bubbles each one surrounded by a film of white of egg. White of egg makes a better froth than water because it is tougher than water and the films around the air bubbles in the froth do not break so easily.
- 7. When a wave rushes up the beach and breaks, the water has to run back into the ocean. Meanwhile another wave climbs on top of the water running back. On the top of the water you see a wave advancing toward the shore, underneath there is a seaward-flowing current of the water belonging to the previous wave.
- B. First be surrounds himself with a protective coating woven like a spider web, called a cocoon. Inside this all his internal organs disappear. His body becomes a mere lump of matter in which the beginnings of the body of the butter-fly appear slowly. Finally, the butterfly is complete, it pierces the cocoon and comes out. Just what produces this mysterious change inside the cocoon is still one of the great mysteries of science.
- 9. The flux stalks are placed in running water where they disintegrate so that the fiber from which linen is made can be removed. This disintegration is caused by bacteria. Without it the fiber cannot be separated from the stalk. and without the fiber, linen itself would be impossible.
- 10. When we cat more salt than we need, too much gets into our blood. This excess has to be washed away. Thirst is a sign that the body needs more water for this purpose.

Dangerous Reading

unaury He say tion is

Would You Enjoy a Lunch with Beatrix?

Beautiful Bestrie, immortal in fascination, irresistible in mysterious feminine appeal with a touch of the devil. If she came to your town, would you invite her to lunch, if you had the chance?

Of course you would, and that luncheon would be history in your life, for Beatrix, Tharkerey's beroine, is one of the most tuntalizing women ever created.

Beatrix is not alone. There are dosens of these exciting women waiting for you.

You feel their presence in the room with you electric, industanting. As if by magic they step out of the pages that hold them, to you. They are as alive as the girl you noticed on the street today. Hundreds of then have fallen in love with them.

You don't seek out the commonplece girl in real life. If women interest and delight you, don't be content with pile, dull beroines who are only imitations of the colorful great ones.

That is the endless pleasure of The Golden Book. There you are always sure of meeting the most wander't! women who ever sent a man's heart pounding. From all countries and all times are the women it would thrill you most to know. Meet them in The Golden Book.

AMONG THE CONTRIBUTORS TO
THE APRIL ESSUE ARE:
W. Somerset Maugham James Stephens
Georges Clemenceau
Stewart Edward White
Lafcadlo Houra
Joseph C. Liorella
Stary Authoritet
Robert L. Stevenson
Thomas Hardy

Anatole France was a writer unsurpassed in modern times. He says the beginning of education is being interested. You

can't learn when you are bored. Hasn't your own experience taught you that?

How many people hate works of genius today because they were forced down their thrusts at a time when they found them dull? How many really great books and plays have been eternally spoiled for you because you were bored by them and had to read them at school, or from a sense of duty?

The truth is, whether a story was written last week or a hundred years ago whether it is by a "chasic" author or a widely-heralded heat seller if it is dail it is dangerous reading for the man and woman who have discovered what aducation

When you have laughed, wept or thrilled over one short story that is really good; when you have been absorbed in one truly moving book; when you have sensed life a little more beenly because of the winged weeds of one vivid poem, you have contributed more to your education than a man has received from a scores of impressive volumes read from a sense of duty.

That is why



makes such an appeal to the render who demands something interesting and at the same time enduring. From the vast storehouse of the world's classics, written perhaps this year, perhaps thousands of years ago, each month it offers you those great stories, poems, plays and adventures that remain great because they are slive today.

As the telephone, the automobile and the radio enable you to live more righly, this new and delightful magazine has been impired by the modern spirit to give you the pure gold that genius has mined. From all countries and all times it brings you adventures into intersture.

The charm of The Golden Book is like the charm of an exquisite bouquet, of a delightful meal—just the right selections relative to you and to each other. It is that indefinable thing—the personality of The Golden Book—that has brought in one year 200,000 devoted readers. It is really edited,

Offer for Readers with 20th Century Minds

Everyone who loves books that are interesting will use at once the deciding possibilities of such a magnetise.

In order that you may know yourself how stimulating The Golden Book can be, we have decided—for a little while only—to make a special offer to new sub-acribers. The regular price of The Golden Book is twenty-five cents a copy. We are going to send you two issues at our expense, and that is how. If you art at once we will give you The Golden Book for six months for \$1.00 instead of \$1.50. But—this is only for prompt action.

Simply fill out the attached coupum and smill it is us today. Do it, now, while you are looking at it. This is only a temporary introductory offer to new subscribers. We cannot offer it long. We do not promise ever to make it again. Some or later you are going to become enthusiastic about The Golden Book if you enjoy reading fascinating stories. Send the coupon at once and be glod. Do not wait and be sarry.

Only One Prompt Dollar

51,00 The Golden
Book Magarine
it 53 Fifth Avenue.
New York
Bend The Golden Book
to the address below at
Special Introductory offer,
elx months. I suclose \$1, iostead of the usual \$1,50.

Name

P.S.M.

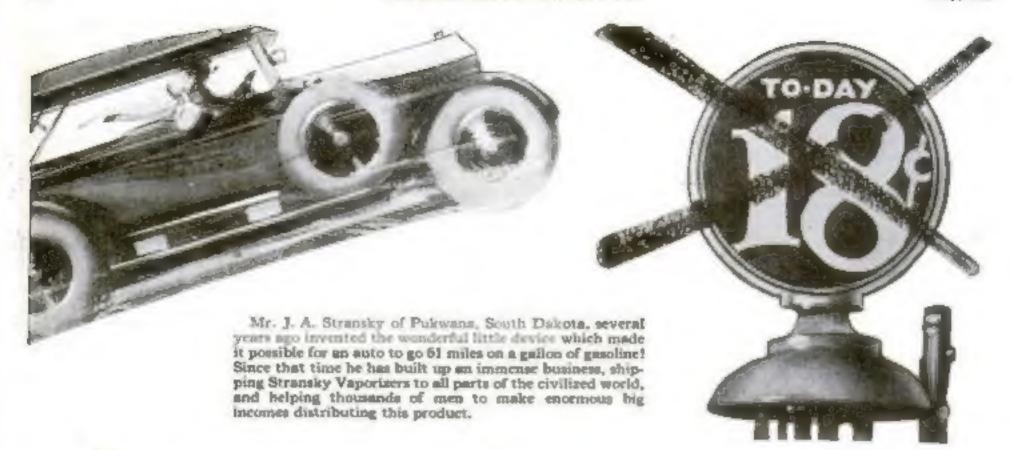
4-96

Copylocherid mustime:

Sphedering

Offer 4 Marchs for ST

This sual on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 6.



Inventor Cuts Gasoline to Ora GALLON!

Now you can cut your gasoline cost as low as 9¢ a gallon. An amazing new invention makes practically any car give twice its regular mileage to the gallon. Many run from 37 to 57 miles and up to 61 miles a gallon. This wonderful invention is the work of Mr. J. A. Stransky of Pukwana, South Dakota. Already it is being used by over a million satisfied car owners—on all makes and models of cars. And now the inventor will send you a sample at his own risk! Read his offer below. Many now

Earn \$250 to \$500 a Month!

Here is one of the biggest inventions of the century—an invention almost as revolutionary as the invention of the auto itself. This wonderful little device adds more power

and mileage to a motor, reduces spark plug trouble, prevents overheating, makes engine start major, and prolongs life of motor—and it's making fortunes for agents and distributors. You can easily earn astonishing big profits in full or spare time—many are earning \$250 to \$500 a month!

Here's how it works. Every carburetor is adjusted to make starting easier—it gives a rich mixture to start a cold engine. But once the engine gets heated up the mixture is far too rich. Half the gasoline is drawn into the

cylinders in a raw state and instead of exploding, it burns. This causes a heavy deposit of carbon. But this startling little device changes all that. As soon as the engine warms up, this device, the Stransky Vaporiser and Decarbonizer, automatically begins to admit a much larger volume of air, thoroughly vaporizing all the gasoline, giving it fully 50° a more power—breaking it up

no that it explodes instead of burning!

ACENT EARNS \$120 In One Day

I have build out that the estatuly will do what you would be would be true I took fact to refer to not do and would thus it was long. My long rane built the gas and it pulls better - J. M. James.

bellet in I Figure? My gas bill has been rut house in haif. I have remained even parties of curbon from in engine Billione I installed in my ragine run agreed as mer starts ensur and que for I went out started about a house and contact of the curbon of the curbon about a house and remarks II or see J. A. Williams.

Sold 12 to Volice Tasl Co. Yesterchy I soud the Yester Tasl to a superface after the had read use out for a week F J Manker R J.

511 In One Wourt-The results of one hours work-II men gave me orders for the Vaporture J. W. Cronk.

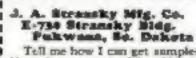
Introductory Sample Offer

To introduce this new invention Mr. Stransky, the inventor, will send a sample at his own risk. Write him at once for his proposition.

You can earn big money just telling your friends about this startling new device—in your spare or full time. J. M. Jumes made \$120 in one day. Vernon Games netted \$94 in eight hours. The demand is enormous. Every auto owner in the country

—and there are 20 million of them—wants this splen hid little device the instant he sees it. Just send the coupon for full details of our introductory sample offer. Mail it right now—today.

J. A. STRANSKY MFG. CO. E-730 Stransky Bldg. Pukwana, So. Dakota



Carprol trivi in itemal.

Mileson and Marie device puts the post of

Fits wonderful little desire cuts the cost of consists to half by making providedly any car give take its regular different to the gallon of quade it consists for a cur to go at miles on a gallon of desired.

Ford Runs to Miles On a Gallen.

I made approximately 60 miles per gather of gasis a Ford Stellar, as I made in miles on our quart, of gas— O. B. Zeigier, Ph.

35 Miles with Buick

Varietieurs installed on touth Buich and Ford and are doing womiterful work, getting 22 miles on Buich and 51 tuttes with Ford. Harvey C. Happie, Pa.

Chevrolet Makes 43 Miles On a Callen

We have treed them out. Ford got 40 miles out of a dallow of the half Cheurolet got 42 miles. y as a series load.

This seal on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 5.



"The fragrance of pipe-smoke enchants me"



City tyme named

The American Tobacco

